RAILROAD GAZETTE

FRIDAY, APRIL 20.

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Contributions.

Adhesion and Friction.

TO THE EDITOR OF THE RAILROAD GAZETTE:

The question as to whether the friction of dry surfaces varies with speed is somewhat important in its relation to brakes. Many statements have been made by scientific men as to the results of experiments on this point, but a careful study of their recorded experiments reveals no warrant for the assertion that the co-efficient of friction varies at different speeds. The mistake has probably arisen from an unconscious misuse of words. Adhesion is one thing and friction another. Adhesion occurs between stationary surfaces, but friction can't be so conceived of. It is adhesion that is both static and kinetic; friction is always kinetic. Adhesion is at its maximum when static, kinetic adhesion varying inversely with speed. Kinetic adhesion is the co-efficient of friction, friction being a product of thi co-efficient and velocity.

Equal amounts of momentum will be absorbed by equal amounts of friction; but moving bodies contain stores of momentum that are as the squares of speeds, so that more momentum must be absorbed to reduce speed from high than from low velocities.

Rolling adhesion is also static. So long as the wheel rolls it is capable of transmitting maximum impulses from the rail, depending upon its weight and independent of speed, nearly all of which impulse may be converted into friction by the brake shoes. But when the wheel skids its adhesion becomes kinetic and falls to the moment of the speed, this reduced adhesion being the measure of the friction then produced.

Brake-shoe adhesion is kinetic and increases with decrease of wheel velocity. But the increased co-efficient doesn't give increased frictions. It was this kinetic adhesion of brake-shoes that the Westinghouse-Galton experiments diagramed as proof of varying frictional resistance, and that has given rise to a widespread misunderstanding as to the true action a id duty of brakes. G.

Wheels and Tires.

LONDON, April 6, 1888.

TO THE EDITOR OF THE RAILROAD GAZETTE:

I have read with great interest the account of the meeting of the New England Railroad Club on the 14th of last month, when the above subject was discussed. As some of the members spoke in favor of wooden wheels, and as to the results obtained on the continent of Europe, I may give some facts which might interest them.

Some fifteen years ago, I introduced the wooden wheels into Sweden, with a view of saving my rails, on account of their greater elasticity as compared with iron wheels, and I had the benefit of consultations with and drawings from Mr. Mansell himself. Still the wheels soon came to grief, and wheels with wrought-iron centres and Mr. Mansell's retaining rings were adopted as the best type. A second trial was made some ten years later by the engineer-n-chief, who saw the wheels made himself; but the result soon turned out the same, namely, the joints opened through the dryness of the climate. The result was the same in Russia and in other countries on the continent of Europe. In England, however, they still continue to be almost the favorite wheel, and the reason has been a puzzle to me, as it has to many others. There is no doubt that the English damp climate, so disagreeable tc human beings, is the salvation of the wooden wheel, for there the joints of the wood never shrink, but always keep tight, and as they are now made of dry teak the results are generally very good. As for endurance and elasticity to road and rolling stock, they are far superior to the iron wheel. For countries with dry climates and with extreme differences between the summer and winter temperature, they are not the thing, but wrought-iron centre wheels, with retaining rings keeping the tire on even when bursted, are at present the safest and best.

I notice the subject for the next meeting will be "Heating Cars by Steam." I think no country has had more or better experience on this point than Sweden, where the climate is so severe that mercury freezes every winter, and journeys are long enough to necessitate an even, comfortable temperature for the passengers. I shall, therefore, follow the discussion with great interest. C. P. SANDBERG.

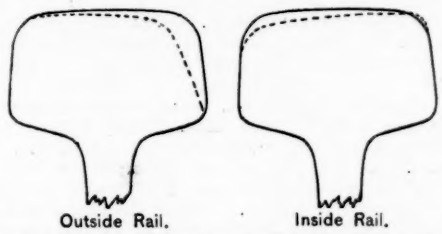
The Shape of Rail Head and Wheel Flanges.

CUMBERLAND, Md., April 11, 1888.

TO THE EDITOR OF THE RAILROAD GAZETTE:

I reply to your inquiry to the extent of my present information.

1. As to the wear of the rail head on the inside of the curve, the inclosed drawing will show it just as it now exists on our line, and, with it, the wear also of the outside rail opposite.



Outside Rail. Inside Rail.

2. The flanges not only of the wheels of our own cars, but also those of other railroads which run over our line and which have been examine', show, when worn, identically the same line of wear as that of our locomotive flanges.

3. The flanges of our locomotive tires are worn about equally on the front and rear drivers; but as there is a great deal of backward running, I fear that the conditions I report will not satisfy the point of interest which doubtless prompted this inquiry.

4. Our locomotives have flanges on the front and rear pairs of drivers, and the two intermediate pairs are without them.

5. The wear upon the front and rear wheels of our tenders appears to be about equal, as should be expected by reason of considerable backward running.

I have just read with much interest the communication of Mr. W. Howard White, and your editorial comments thereon, in your paper of the 6th inst. I not only agree generally with Mr. White in his several views, but take even stronger positions than he does on some points. I maintain, that upon the ascertained wear lines, as given by me, and even with the angle of the side of the rail head and that of the inside of the flange coinciding and thus bearing closely together, there is practically no dangerous tendency to *climbing*. Experience in ordinary fast running at times, with trains under full control, and, on one occasion, with a runaway train, down a 3 per cent. gradient, for about four miles, in which the speed was not only reported by witnesses to be "terrific," but apparently so confirmed by many circumstances, has satisfied me that nothing is to be feared on this account. The runaway in point, though attended with very serious consequences, revealed the fact that the rail head was not to be mounted even where worn to such an extraordinary angle. An axle broke about one-third the length of the train from the engine in front, and the truck being dragged upon the ties, when coming to a curved trestle work, broke the small ties upon the latter, and the outer rail went over the side, followed by the two-thirds rear end of the train—consisting of fifty-five loaded coal cars. The locomotive in front, with its one-third of the train, kept on for about another mile—passing safely around semi-circles of 20 deg.—until eventually stopped by the power of the brakes, aided by a broken-down car at the rear end. On this memorable occasion, involving heavy loss of property as well as that of three lives, it seemed to be revealed, that with a well secured track, of good surface, though with rail heads worn on curves to the great angle, and locomotive and car wheel flanges worn to lines as given, there was all security in those combined features that could most reasonably be desired.

It may be supposed that the outside rail of our line of track, at such points of extreme curvature, is considerably elevated, and that thus safety is secured not only as ordinarily against centrifugal force, but by reason thus of the inclined side of the rail head being brought more nearly to the perpendicular. I would say regarding this, that the elevation of our outside rail is but 3½ in. above that of the inside on our sharpest curves; and less elevation is given according to comparative ease of curves. With the earliest construction of the road, in the year 1881, the elevations were very much greater; but, under our practical operations, it has been found that the efficiency of our motive power has been greatly promoted by reductions of elevation. Our speed for coal trains is eleven and for passenger trains twenty miles per hour, though these are sometimes exceeded. Slowness of speed, however, is the essential for the most economical operation of such a line. JAMES R. MILLHOLLAND,
General Manager.

Washouts, Their Prevention and Treatment.

BY WILLIAM BARCLAY PARSONS, C. E.

Washouts usually occur so quickly and so unexpectedly that as a rule nothing can be done to stop their destructive effect while they are taking place. Although proper previous precautions can sometimes avert them, the greatest work in such cases will be to repair the break with as little loss of time as possible, temporarily first, permanently afterwards. The object of this article is not to discuss the proper size of water ways, but to show what can be done to prevent washouts, what to save damage during their occurrence, and especially what is to be done after they have taken place.

At the season of the year when the snows of winter are liable to be carried off in a body by a sudden heavy rain, the ditches should be opened and all small culverts cleaned of any leaves, brush, branches and other accumulation. This work should be done not only at the culvert itself, but for some distance up the stream, especially if its bed be steep. If such materials collect and obstruct the opening, and the water is dammed up, it is forced to discharge under head, an operation which will probably cause undermining, scouring and the collapse of the structure with the bank above it, unless the culvert is an iron pipe with its ends well bedded in masonry walls, and with an apron at the outfall. If the snow be deep, a good, wide ditch should be dug through it, to give the water an easy and uninterrupted flow. If banks are subjected to an erosive side wash, damage can usually be prevented by spreading layers of brush and rip-rapping with stone over them.

During the storm the most profitable work is to see that all water courses, ditches and drains are kept open, and that the water has an unimpeded flow. If banks are being washed away, it does no good to dump in anything but stone. If that is at hand, and can be quickly thrown into the breach, a complete break may sometimes be stopped. At water courses cakes of ice, logs, trees, etc., must not be allowed to lodge and jam. Men in plenty, armed with stout pike poles should be stationed at all bridges where drift is to be expected, to guide floating objects through the bridge. If one tree is allowed to get athwart a bridge pier, it may in the course of a few minutes be the means of collecting a large and formidable jam. The writer has seen a masonry pier actually sheared off by an ice gorge forming above it. Great care should be taken to prevent water from running in a large body through cuts and overflowing the track. If the grade be steep enough to give a rapid flow, a very short time will suffice to cut out all the ballast and to leave the track impassible. A good intercepting ditch dug on the hill side just above the cut, and the keeping of the side ditches clear, will usually prevent this trouble. The track force should be thoroughly drilled as to proper course of action during times of flood without waiting for instructions. Each foreman should have his section constantly patrolled, and should frequently telegraph headquarters as to the exact condition of affairs. Foremen are too apt in case of a break to think that the best thing possible is being done, if they proceed at once to the spot and do all they can to repair the damage. Whereas, if each foreman would keep his superior officer constantly and fully informed, the latter then becomes master of the whole situation, and is enabled to dispose of his entire force to the best advantage. It is one of those cases where complete and

Fig. 1.

united action is more effective than the best of individual effort. In general, track foremen should be encouraged to keep themselves in closer telegraphic communication with headquarters in regard to their daily work than is at present the custom. It not only creates a better morale, but enables t.e roadmaster to handle his division work more systematically.

When the rain ceases the real danger of accident begins, which can be prevented only by great caution and prompt energy. Many structures which look safe enough, may have been completely undermined, and need but the additional weight of a train to cause their fall, as the *Railroad Gazette's* columns too often testify. Since the foundations are still covered by the high water, which will now be muddy and not transparent, the actual state of affairs is hard to determine. Before trains are allowed to run over a line which has been subjected to a flood, every mile should be carefully examined. If the track is still under water and its condition not therefore visible, a man should proceed on foot and ascertain by feeling whether the ballast is still in place and track passable. At bridges, culverts and trestles the foundations can be inspected with poles, by feeling wi h which any undermining or dangerous scouring can be detected. If it is not practicable to do this, and if there are no means of being assured of the stability of the structure, always take the safe side and suspend traffic until safety is beyond doubt.

After a break has occurred it becomes necessary to restore traffic as quickly as possible. The foremen having fully notified the maintenance of way officer by wire of the exact condition of their respective sections, he is enabled to concentrate his forces at such point or points as first demand attention. Timber forms the material with which to quickest bridge over a gap. It is, therefore, a good precaution, just before the breakup of winter, if snow be deep and floods probable, to have several carloads of assorted lumber at each point where engines are stationed, so that it can be quickly run to the point of disaster. If the hole is in a bank of moderate height, and as is usual the water has subsided directly, an exceedingly strong and rapidly constructed trestle can be formed by building up a cribwork of ties, old bridge timbers or trees. The pieces are simply laid across each other as shown in fig. 1. Then on the crib a stick of convenient dimensions is laid for a stringer. In regard to stringers it is well to remember that a good 60-lb. steel rail acting as such will carry an ordinary locomotive going slowly over a span of 5 ft. The construction of these cribs being simple, trackmen can have them built in advance of the arrival of the repair train. In case the break is short, like the result of

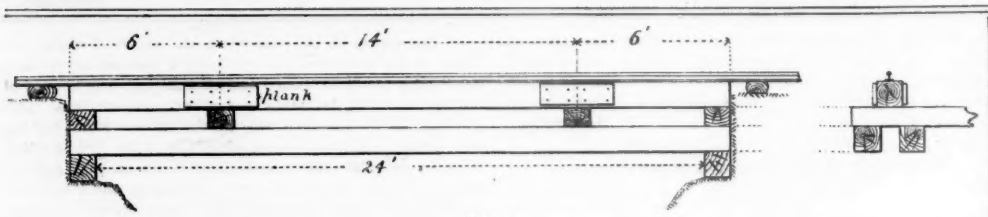


Fig. 2.

the collapse of a culvert, and where the water is still high, forbidding a crib of ties, an effective bridge can be quickly constructed, as in fig. 2, where four 12 × 12 sticks supplemented with some shorter ones, can be made to span an opening as great as 24 ft. On the sound bank place a good sill. For each rail throw across two 12 × 12 pieces 26 ft. long. Then 6 ft. out from each end spike on two cross pieces about 7 ft. long, and on them place the shorter 12 × 12 pieces as shown, securing their joints with a cover piece of 2-in. plank. A load equivalent to 4,000 lbs. per foot of track will strain the timbers up to 2,000 lbs., which figure is not too high for an emergency case under slow speeds. This arrangement is economical in sticks of long length, uses nothing but the most common size, requires no framing, is very quickly put in place, and is very stiff and firm. There being but three pieces, they naturally come to a bearing like a three legged stool, and thus the full working strength of each part is assured. If the break is too large to be spanned by either of the above methods, a regular trestle will have to be resorted to. The bent most quickly framed is shown in fig. 3. The pieces are not mortised, but are held together by the sway braces and the small pieces of plank lapping the joints spiked in place. No refinement of height is necessary, as additional blocking can be placed between the cap and stringer to bring the latter to grade. The length of cap can be 12, 14 or 16 ft., as most convenient, although the latter figure is preferred if the bent be 25 ft. high. If the water has subsided the bents can be stood on mudsills. If they have to be erected in water, they can be floated out to place, when by hoisting the cap by means of a derrick car, the bent will stand up with its sill resting on the bottom. It is then secured in place by plank bracing from the next bent, and held down by the weight of the stringers and track, which are laid at once. Should the current be too swift for such a bent, temporary piers can be

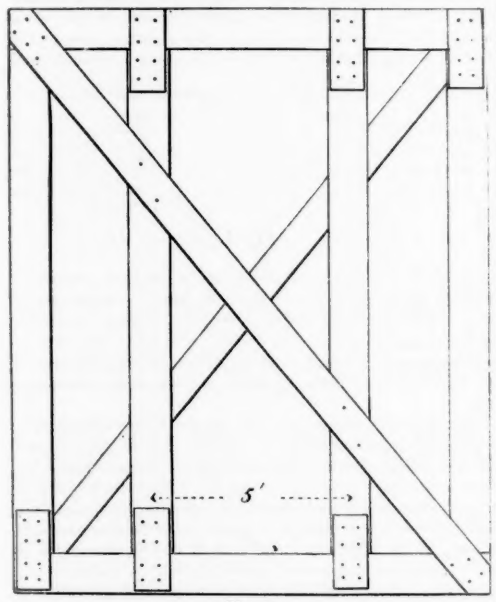


Fig. 3.

made of open cribwork, composed of pieces of timber lying across each other, like the ties previously described. By bringing the end pieces out to an edge, so as to form a bow, the crib will be more easily handled in the stream. With guy ropes to the shore the crib can be floated where desired, and then sunk by filling with stones. Between such piers heavy stringers or small girders can be placed, capable of carrying traffic until the water subsides, when a permanent structure can be erected. Such are some of the expedients for quickly relaying track, at a time when every hour of delay costs money, and when every consideration must be subordinated to rapidity of work. The forms of construction herein described are well adapted for the purpose, in that they use no materials except those always at hand on every railroad; require no tools except a cross-cut saw and hammer, and do not damage the timber at all. As soon as traffic is resumed by means of such temporary structures, steps should be taken at once to restore the solid road bed, guided by the experience of its recent failure.

False work under bridges during erection is always subject to loss from a sudden rise, and with it will go the bridge unless "swung" in time. A good pile trestle is in little danger from merely high water, unless the stream be very deep and swift. Logs, drift and ice in a swollen river lodging above the trestle are the great danger. If a rise be possible, bringing down such material, it is well to prepare for the emergency by leaving in the false work an extra wide opening in the channel of say 20 to 25 ft. Then to have on hand sufficient round or squared timber, about 12 in. thick, which can be lashed together into a "boom," two pieces side by side, making joints. Let one of such booms extend from each side of the large opening to the shore at an angle of at least 45 degrees. The surface of the booms will be sufficient for men to stand on, who with pike poles can guide through the opening all floating material, which otherwise might catch against the piles and form a dangerous jam.

Finally, a word on ice gorges. On our Northern streams the first rise of water in the spring will break up the ice, carry it down until the conditions favorable for a jam are reached, which a bridge usually affords, and there will leave it. Frequently these gorges, formed by cakes on edge and overlapping, will be 10 ft. thick. Usually they are very threatening and should be removed before the next fresh occurs. The materials used for this purpose are nitro-glycerine, dynamite and gunpowder. The first two do not give as good results as the last. They are too quick in their action, and simply blow a hole in the ice without generally shattering it. The best way is to put about 100 lbs. of blasting powder in an ordinary 4-gallon can, with a tight-fitting cork hermetically sealed with common rosin soap. Then attach a rope to this torpedo, make a hole in the ice and allow the current to carry it down stream for some distance under the ice, tying the other end of the rope to a stick laid across the hole as an anchor. It is desirable to get as much water as possible between the torpedo and the ice in order to distribute the effect. It should, of course, be fired by electricity and not by a time fuse, which is very unsatisfactory and unreliable. The leading wires are passed through the cork of the can, and connected sufficiently far away with a magneto-electric blasting machine (the Laflin & Rand Powder Co. make the best form), by a stroke of whose handle at the proper moment the shot is fired. One hundred pounds of powder will break an area 100 to 150 ft. in diameter. Then a gang of men with axes and poles can effect its entire removal down stream. The success of the blasting depends on heavy, concentrated charges sunk deep in the water.

The M. C. B. Automatic Coupler.

The contour lines of this coupler, as established by the Executive Committee of the Master Car-Builders' Association, are given full size in our double-page illustration with the dimensions recommended for length of draw-bars, position and length of dead blocks, etc. The circular accompanying the issue of the contour lines will be found on another page under the head of "Meetings and Announcements."

The accompanying engravings illustrate the position of two M. C. B. couplers under different conditions, and show the difference between the contour lines of the M. C. B. coupler and those described in the Janney patent of 1879.

Fig. 1 shows the position assumed by the couplers of two adjacent cars on a sharp curve. It will be seen that the centre line of the draw-bar on one car forms a maximum angle of about 14 deg. with the draw-bar of the next car. Assuming that the draw-bars had no side play in the stirrup or follower plates, and were always maintained exactly in the longitudinal centre line of the car, the angle shown in the illustration would enable two 34 ft. cars to pass round a — degree curve equivalent to — ft. radius. It is hardly necessary to point out that in practice the cars would easily pass round a sharper curve, as necessarily some side play must exist between the shank of the draw-bar and the stirrup, and the fit of the follower plates must also allow a certain amount of play. The draw-bars in practice can assume an angle with the longitudinal centre line of the car and thus permit the cars to pass round a sharper curve than is indicated by the angle of 14 deg. shown in the illustration, fig. 1.

Fig. 2 shows that when two cars are standing on a tangent the amount of loose slack is about ⅛ in. The distance appears a fair allowance for inaccuracy of workmanship and any roughness or excrescences on the knuckles or drawheads. Should two coupled cars stand on a rough track or at a point where the grade changed, this amount of slack is likely to be diminished. Assuming that the coupling is immediately above a point where two grades of 100 ft. per mile meet, the axis (in a vertical plane) of one draw-bar will be inclined to that of the other at the rate of about 1 in 25. With a knuckle 9 in. deep this would require $\frac{4\frac{1}{2}}{25} = .18$ in. loose slack between the knuckles.

This figure, however, is obtained on the assumption that the centre line of the draw-bars is parallel to the surface of the rails on which the car stand. This is not necessarily the case, as the loose fit in the stirrup and the side play in the follower plates, etc., allow the draw-bar some vertical and angular movement by which it can accommodate itself to the varying angles which adjacent cars assume, owing to changes of grade and the vertical inequalities of the track; but even were the draw-bars rigidly fixed, it is evident that the ⅛-in. slack would allow the cars to pass over a good track without any undue strain on the knuckles.

Fig. 3 shows the side play allowed when the cars are standing on a tangent. This amount, about $\frac{3}{16}$ in., is also increased by the loose fit of the draw-bar in the stirrup, etc.

Fig. 4 shows the difference between the Janney lines as originally patented and the contour lines now adopted by the M. C. B. Association. Dotted lines show the original Janney lines as described in his patent, and the solid lines those of the M. C. B. coupler. It will be observed that the essential feature in the lines, the reverse curve of the coupling face of the knuckle, is identical in both couplers, and that the only difference exists in the inner face of the recess in the body of the coupler, and the outer or buffing face of the knuckle. The contour of these parts is not very clearly described in the Janney specification, and possibly are not so correctly or carefully drawn as the essential part of the coupler. The accompanying engravings have, however, been carefully prepared and show the patented lines as correctly as is possible under the circumstances. We understand, however, that the Janney as now manufactured is somewhat modified as regards the contour of the buffing face of the knuckle and the recess in the draw head and probably the dotted lines do not correctly give the contour of the Janney as now manufactured in these particulars. A knuckle made to the solid lines will evidently be somewhat stronger than if made to the dotted lines, and when set not to couple any blow will be received near the pivot pin of the knuckle rather than on the point, thus diminishing the strain on the knuckle. The essential portion of the lines patented appears, however, to have undergone no modification, either in the Janney as now made or in the form adopted by the Master Car Builders' Association.

Standard Frogs—Report of the Committee of the Superintendents' Association.

NEW YORK, April 9, 1888.

To the President and Members of the Association of American Railroad Superintendents:

GENTLEMEN: The undersigned, a committee appointed at a meeting of this Association, held at Cincinnati on April 15, 1886 (see pages 7 to 13 of proceedings of said meeting), beg leave respectfully to report upon the matters referred to them.

Upon page 7 of said proceedings will be found a letter from the President of the Roadmasters' Association, which was so referred. This letter embodies a "Report of Committee upon Railroad Frogs and Guard Rails," in which said Committee of the Association of Roadmasters of America made five recommendations upon as many different points which are in said letter set forth at large.

Your committee would indorse the first of these recommendations, being to the effect that the spring rail frog is superior to the stiff rail. We think it superior for use in all main tracks, and we think its average comparative life in the main track is not overstated.

We would also approve the second recommendation of said committee, so far as to favor the riveted frog in preference to the clamped frog.

In regard to the third recommendation, we would propose for both spring and stiff rail frogs such a length from the theoretical point to the heel as will give a sufficient opening at the heel for the splice bars without cutting, and for this purpose we would recommend as follows:

No. of frog.	Length.	No. of frog.	Length.
5	5 ft.	11	10 ft.
6	6 "	12	10 "
7	7 "	13	11 "
8	8 "	14	12 "
9	8 "	15	13 "
10	9 "		

For a stiff rail frog we would recommend from point to toe a uniform length of 4 ft. to and including No. 8, a length of 5 ft. from No. 9 to 12 inclusive, and a length of 6 ft. from No. 13 to 15 inclusive. These lengths being desirable for the purpose of making room for the splice plates. For spring rail frogs of all angles a length of 7 ft. from point to toe. We present a drawing herewith, showing the different numbers of frogs, both spring and stiff, with their dimensions; also a tabulated list of lengths.

In regard to recommendation No. 4, as to what should be the guard rail distance and width of channel or throat of frog, we would recommend that it should not be less than 1⅝ in. and not more than 2 in. for each.

The fifth recommendation is in regard to the gauge, answering the question whether it should be exact at point or loose. We think it should be exact, not only at the point but opposite all parts of the frog from heel to toe.

To your committee was also referred the report of Committee of this Association, dated Providence, R. I., Oct. 18, 1865 (page 2 of same proceedings).

Passing over the first part of this report, which would seem to need no action at our hands, we would respectfully give our opinion on the numbered recommendations contained in said report.

First, that wing rails of fixed frogs be alike at both ends so as to be interchangeable. This recommendation your committee do not approve, for the reason that after the wing rail has worn down at one end and is in condition to be reversed, the frog point will also be worn down. The reversed wing rail will be at a different elevation from the point of the frog, and for that reason the frog becomes unfit to remain in the main track.

The second recommendation is in regard to measurements of frogs. On this point your committee would recommend that they be measured on the line of track, and not on the centre line of frog, as proposed, for the reason that all other measurements of track are made along the rail.

We approve the third recommendation, as it is merely a statement of fact.

In place of the fourth we would recommend that the length of frogs from point to heel and from point to toe be as we

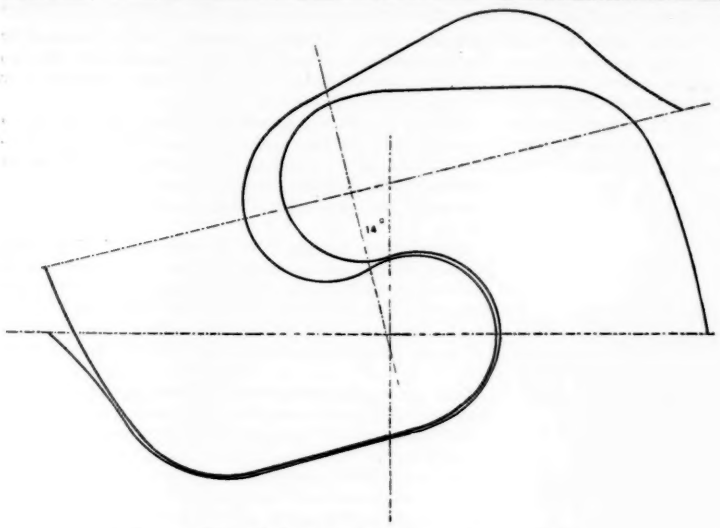


Fig. 1. Two M. C. B. Couplers on a 38 deg. Curve.

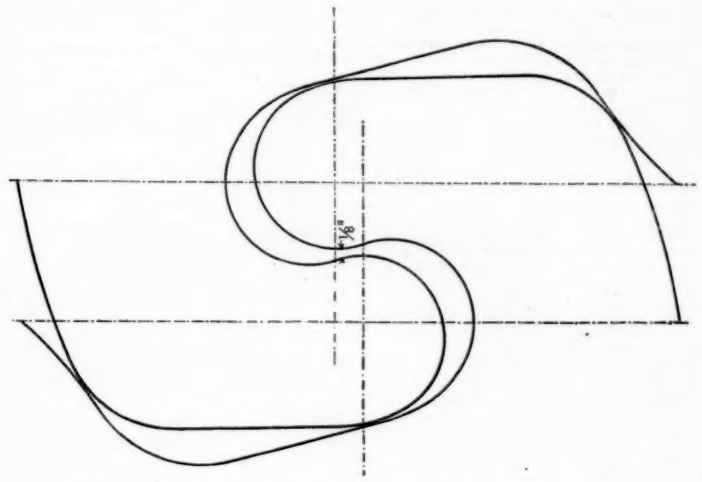


Fig. 2. Two M. C. B. Couplers, showing slack, cars on tangent.

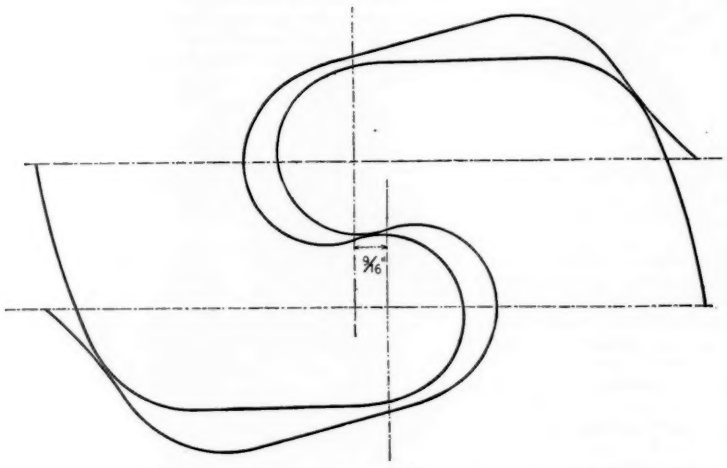


Fig. 3 Two M. C. B. Couplers, showing side play, cars on tangent.

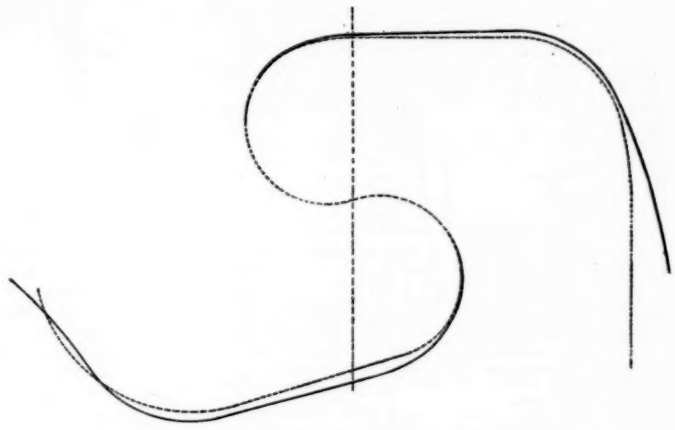


Fig. 4. Difference between M. C. B. Coupler and Janney Patent, 1879. M. C. B. Coupler, solid lines; Janney, dotted lines.

THE M. C. B. AUTOMATIC COUPLER.

have above suggested, and that these lengths be always in even feet measured along the track.

Respectfully submitted,

H. STANLEY GOODWIN,
ROBERT BLEE,
P. S. O'ROURKE,
Committee.

The Inter-state Commerce Commission on Underbilling.

The Commission has been investigating the allegations regarding underbilling on various roads and has issued a vigorous report, written by Commissioner Walker.

The report sets forth in an authoritative and official manner an array of facts which give illuminating views of these irregularities. These facts have heretofore been the subject of much vague comment, railroad managers have known of underbilling and of the devices of that sort of people who describe cigars as unmanufactured cabbage-leaf; but it was always on some other fellow's road. Commissioner Walker now calls names, and intimates that the ignorance which managers manifest about the doings of their own roads must be maintained only by considerable effort. The principal conclusion of the opinion, which gives an exceedingly clear and full review of the facts, is that whatever the sins of shippers or the weakness of the law, the Commission will be inclined to hold the roads to a strict accountability; they must not try to evade responsibility for discrimination by saying that their agents cheated without leave. Following are extracts from the decision, some portions being condensed:

It perhaps was not to be expected that the giving and obtaining of special favors in transportation would be abandoned immediately upon the enactment of the law, either by shippers who had been accustomed to enjoy them in business strife, or by carriers who had been wont to employ them for the purpose of obtaining traffic in the face of competition. The education of the public, under the business practices which had been not only countenanced but encouraged by the carriers for a long series of years previous to the passage of the law, had been such as to largely obliterate the idea of honor as entering into the case in any degree whatever, and to suggest that the new law was not passed to be obeyed, but to be evaded. The time may come when it will be thought to be as disgraceful to obtain transportation dishonestly as to acquire property dishonestly: and when citizens who control the agencies of public carriage will consider the permission of unequal advantages in transportation in the same light in which they now ought to regard a fraud upon the ballot-box. It is not obvious in what way the obtaining of free transportation or reduced rates of transportation by trick or device is less dishonorable than any other from of cheating; nor is it apparent how the procuring of business by the carriers, through practices whereby one shipper is given a pecuniary advantage over another in a public service, differs ethically from the payment of a bribe.

Nevertheless neither shippers nor carriers have been accustomed to stop and consider these questions. If presented they have been brushed aside, in the race for business which absorbs the entire community. A common carrier should be as sensitive to suspicion of unfairness as a register of deeds, clerk of a court, or any other public servant. The purchase of his services at a stated price, equal to all, should be a matter of course with every shipper, without any more thought of obtaining personal advantage in the transaction than of counterfeiting the coin that pays the bill. * * * The attention of the Commission has been attracted in various ways by allegations that the device known as "underbilling" is being largely employed by shippers and carriers as a method by which a less compensation is paid by one person than by another for a like and contemporaneous service. It became the duty of the Commission to investigate the subject, and such an investigation has accordingly been had. Time was not available for a full examination of the question in all parts of the country. * * *

There is no doubt whatever, and the Commission finds the fact to be, that an immense amount of traffic has been carried by the railroads of the country during the last six months, and to some extent during the entire period since the passage of the act to regulate commerce, the tonnage or weight of which was underbilled.

* * This has not been confined to any particular road or group of roads, but has been very generally prevalent in various parts of the United States, and even upon lines which at the same time were protesting most emphatically their absolute conformity to the requirements of the law. The practice is unequivocally condemned by every railroad official and traffic manager whom the Commission has approached upon the subject; and they have been very many, including the officers of most of the leading lines in the Central and Western states; but at the same time the fact cannot be denied that the same lines have admitted traffic upon which the billing was short, and that usually they have known, or easily might have known, that such was the case. * * Nothwithstanding the excuses offered, the officers must have been negligent. The inspection bureaus of the Trunk lines and other roads are commended, but the Commission will not accept this device as a substitute for the requirement that every carrier be responsible for the correctness of the weight and classification of the freight received, so far as the same can be practically ascertained.

The Commissioner then quotes from the evidence:

Sixty-one cars from the Michigan Central were weighed at Black Rock in February, 1888; of these the billing of 57 cars was short, in all, 273,350 lbs., and 4 cars were overbilled, in all, 4,100 lbs. Of the cars underbilled the errors upon 20 exceeded 5,000 lbs. each, and on 4 exceeded 20,000 lbs. each; while on 18 the errors were less than 1,000 lbs. each, in which case they are disregarded by the inspectors, a margin being necessary for variations of scales, differences in weight of cars when dry, when saturated with moisture, when loaded with snow, or when not thoroughly cleaned, as well as for other reasonable corrections and possible minor errors. * *

Forty cars from the New York Central west-bound were weighed at Suspension Bridge in February, and were found short, in all, 109,280 lbs., or 8 per cent. of the total weight as way-billed. For example, a car-load of iron billed at 32,000 lbs. from Albany to Detroit was found to weigh 42,400 lbs.; a car-load of salt from Rochester to Chicago, billed at 24,000 lbs., was found to weigh 32,350 lbs. Other underbilling was in car loads of potatoes, cider, apples, glass, etc. Numerous examples are given of the most flagrant east-bound underbilling, corn weighing 36,000 lbs. being billed 26,000, and lumber weighing 43,000 at 30,000. In all some 50 car loads of grain were shipped from Toledo to various points, of which the average underbilling was over 12,000 lbs. per car, considerably more than 25 per cent. of the actual weight being thrown off.

These were nearly all from one elevator, but other firms had no doubt done the very same thing. When the underbilling was discovered by the inspectors at Buffalo a demand was made upon the shippers, who paid the amount required as freight upon the total weights reported. The railroad agent asseverates that he made no suggestion that the grain might be underbilled, and had no suspicion that such was the case. The shippers, however, seem in some way to have obtained an impression that the weights given by them would be accepted without correction.

* * West-bound freight cannot well be examined, because of lack of room, lack of time, etc. Deceptive classification is, therefore, common. * * A person who sells an article to another person representing it to be what it is not is liable to punishment for the fraud: a willful misrepresentation to a carrier for the purposes of reduced freight charges is not different in principle. * * Carriers might stop underbilling of car-load freight, and they ought to be held largely responsible for its existence. The carrier should always be furnished with the actual invoice of the shipment, and should have an opportunity to inspect the original books of the shipper for the purpose of verification; but even this should not be regarded as a substitute for the actual knowledge by the carrier's agent of the contents and weight of every car. Each carrier should hold each billing agent responsible for the accuracy of his way-bills. If facilities and assistants are not at hand they should be provided. Carriers should have sufficient moral courage to attack this subject thoroughly and individually, without waiting for the action of competing lines. If this work can be done at the way side and in the case of small shippers it can be done in cities and upon shipments of magnitude. It seems to be simply a question of expense, and the observation of the Commission in respect to the billing of large shipments from important points shows clearly that the expense of thorough inspection at each initial station before accepting the freight for transportation would be made up many fold in added revenue to the carriers.

It would not be an unreasonable rule of evidence which would hold the carrier responsible for ignorance in almost every case of underbilling by weight.

* * Another cause of underbilling is found in the active competition for traffic, under the stress of which a vast number of soliciting agents are employed, whose officers are found not only on the corners of the most expensive streets of every city, but in the rural communities as well; and who represent not only the carriers directly, but also various so-called "lines"—red, white or blue, as the case may be, whose only interest is to obtain traffic; who have little responsibility of their own or to their ultimate employers; and whose object in life is necessarily to make a record of success in securing business which shall warrant the continuance of their employment and of their pay. All this gilded advertisement and persistent solicitation in the end is paid for by the public. The business exists and the public service of transportation must be done, whether or not any agent intervenes to help along the contract. * * Without the most rigid supervision this system cannot fail to be dangerous. When soliciting agents are compensated by the payment of commissions,

the danger is largely increased. The division of a commission between the soliciting agent of a railroad or of a line and his customer obviously operates to give the shipper a lower rate of freight than the published schedule, and as the matter is within the control of the agent's employer the carrier which permits it is reponsible for the violation of law involved.

A highly reputable merchant testified that he had been approached with a suggestion that one of his employés might be taken upon the salary list of a carrier if his firm would give its business to the road. A letter was produced, written by a shipper to another carrier, asking to be placed in some such position. * * The pretense of an employment or agency would not for a moment protect the carrier. There is reason for the belief that a critical inspection of pay-rolls, vouchers and subvouchers by the responsible officials of many roads would disclose to them a startling recklessness on the part of their subordinates. One shipper was told that while no rebates could be given upon shipments after April 5, 1887, yet if he would furnish a list of 100 cars shipped prior to that time they could be taken up for rebating, upon new freight being received of like amount. * * South Omaha packing houses have underbilled lard and provisions eastbound and have had the refrigerator cars returned from Chicago private sidings billed and carded as empty, when they were in fact loaded with nails, lumber, salt and other supplies needed at the packing houses. The Western Railway Association has got the packing house firms to sign an agreement allowing the roads to inspect their (the shippers') books, and this agreement has been in force since March 1, but the Commission hesitates to accept it as a substitute for the performance by the carriers of their duty under the law to see that each shipper pays a just and exact amount.

The following instances of deceptive classification were found at Chicago and St. Louis on a single day.

Articles.	Correct classification.	Description given by consignor.	Class.
Pickles in glass	1	Bbl. pickles	4
Sassafras root	1	Fanner's bark	3
Bird cages	D 1	Box nested tin	2
Twine	1	Jute	4
Acetic acid	D 1	Vinegar	4
Groceries	1	Dried fruit	4
Chewing gum	1	Candy	3
Glass bottles	2	Crockery	4
Glassware	1	Earthenware	4
Cotton bags	1	Burlaps	4
Hardware	2	Iron bolts	4
Printed matter	1	Printing paper	3
Looking-glass plate	1	Window glass	4
Drugs	1	Earth paint	4

A car billed as "wooden ware" was destroyed and a claim for $1,800 was presented, enumerating a large number of articles of merchandise, including brushes, drugs, stationery, and even a parlor organ. Boxes of stationery have been billed as hardware upon the justification that they included one or two ink-erasers, etc. * * This practice has assumed such proportions that all of the "house freight" received at the larger western cities is now opened and examined. Delay and annoyance results, but the increased revenue seems to justify the carriers.

It is not the desire or the purpose of the Commission to relax in the least degree those requirements of the Act to regulate commerce which hold carriers to a rigid responsibility for putting an end to all unjust discriminations and all undue or unreasonable preferences. It is the duty of the carriers to permit nothing whatever which can be construed as subjecting any person or locality "to any undue or unreasonable prejudice or disadvantage in any respect whatever." The application of these obligations to the carriers in various respects has been indicated above. It is clear that they have hitherto been seriously remiss, and while keeping within the letter of the inhibitions against "special rates, rebates and drawbacks," they have permitted, if not encouraged, the adoption and employment of other devices, especially the various forms of underbiling, which have indirectly produced the same result. A halt has now been called and a serious effort is making on the part of very many of the roads to put an end to this vicious practice. The result will be closely observed, not only in respect to the particular cases mentioned above, but also upon many other kinds of traffic to which the attention of the Commission has been called. Section 10 of the Act to regulate commerce provides that any common carrier subject to the provisions of the Act, or any director, officer, agent, etc., thereof, who shall wilfully do or cause to be done, or shall willingly suffer or permit to be done anything in said Act prohibited, etc., shall be deemed guilty of a misdemeanor and punished accordingly. It is proposed to amend the Act by imposing a moderate penalty upon shippers who, by false billing, false classification, false weighing, or false report of weight, or by other devices, knowingly and wilfully obtain transportation for their property at less than the regular rates. In view of the fact that unscrupulous persons are to be found in mercantile pursuits as well as in the employment of the railroads, that unjust discriminations obtained by means of these devices invariably operate to the direct pecuniary advantage of some shipper or consignee, that the evidence distinctly shows various instances and methods by which shippers have been able deliberately to defraud a carrier in the matter of transportation, without fault or connivance on the part of the latter, and of the various other facts and considerations apparent in the foregoing pages, the proposed amendment is clearly necessary to make the Act more thoroughly efficient. No manner is perceived in which the enforcement of such legislation can operate to the prejudice of honest shippers. Underbilling, in its devices and its fruits, must necessarily be participated in by the owner of the goods; it cannot be absolutely put down by imposing penalties upon the carriers alone. The complete termination of this practice is exceedingly to be desired, and there can be no doubt that this end will be greatly promoted by legislative recognition of the fact that not only the carrier but the shipper also, who both participate in the methods and the results of unjust discrimination, are each responsible to the public for the wrong which every such transaction involves.

The Rotary Steam Snow Shovel.

The construction and performances of the Rotary steam snow shovel have been often described in these columns, but until this winter only one machine had been constructed and put in operation in this country. Many improvements were made in the construction during 1886, and a comparison between the Rotary as first illustrated in these columns and the present style as shown in the accompanying engraving, fig. 6, will explain the nature and scope of these improvements.*

*The Rotary as first constructed in Canada was shown on pages 662 and 663 of the *Railroad Gazette*, Sept. 12, 1884. In this machine the knives and fan blades were mounted on two concentric shafts revolving in opposite directions and the snow was always thrown to the left of the track. The first machine constructed in the United States was illustrated in the *Railroad Gazette*, April 24, 1885. In this machine the snow could be thrown either to the right or to the left of the track, the spout from which the snow issued being provided with a movable hood. The knives were also reversible, so as to cut whichever way the knife wheel was revolved. The knife and fan wheels were mounted on concentric shafts (one solid and the other hollow) and always revolved in opposite directions. The present machine has been simplified by the elimination of the hollow shaft, both knife wheel and fan blades being solid on one shaft. The knives are also now made to reverse automatically.—EDITOR RAILROAD GAZETTE.

During the past winter the Rotary steam snow shovel has been largely used in the West for clearing railroads of snow, and some particulars cannot fail to prove interesting. Even in the comparatively mild climate of New York, where the recent blizzard blocked every railroad running into that city, the failure to clear the roads promptly not only led to great inconvenience and suffering, but the efforts made,

Fig. 1.

though comparatively slow and inefficient, cost many lives and a great sum of money, many thousand men being engaged in the primitive process of shoveling away the snow. The experience of the past winter in the West seems, however, to show that an efficient means of removing snow by steam power has at last been devised and made a practical success.

While the accompanying illustrations, figs. 1 to 4, represent the ordinary methods of clearing a line of snow as adopted in the Northwest, fig. 5 represents the Rotary steam snow shovel at work, while fig. 6 shows its appearance and general construction.

Fig. 1 shows a cut being cleared by shovelers, who throw the snow from the bottom of the cut up to a terrace, whence it is thrown by another set of shovelers to the top of the cut.

Fig. 2 shows another method adopted in snow which is packed hard and frozen. The snow is cut out in large blocks, which are attached by a rope to a locomotive, as shown in fig. 3, and hauled away to be tipped over the nearest bank. The lower rope has to bear the strain of detaching the block of snow, which is generally frozen solid to the ground. Pieces of wood are therefore inserted between the snow and the rope to prevent the latter cutting into the snow.

Fig. 4 shows a locomotive wrecked in charging or bucking

Fig. 2.

at a snow bank. It will be seen from the following account that the engine and tender trucks were stripped from under her when the engine struck the face of the drift:

"Engine 568, Chicago & Northwestern, was equipped with one of our best iron plows, strongly braced; when wrecked she was running into snow about 9 ft. deep, between Canby and Gary; this snow was somewhat harder than the Rotary took out on four-mile hill west of Gary. When hitting this snow at 50 miles an hour, engine 568 would go about twice her own length into it. When wrecked it was found that her plow nose had doubled under her, and she rode up on snow, and when found was 5 ft. high above the rail. Her engine and tank trucks were all on the track at the face of the drift." Numerous accidents occur in the ordinary method of bucking snow-drifts with a wedge plow pushed by several locomotives, but we understand that no accident occurred and no one was injured where the snow was cleared by means of the Rotary.

On Feb. 17 a Rotary started from Fergus Falls, Minn., to open the road to Wahpeton, Dak., on a branch of the Northern Pacific. Mr. N. D. Root, Asst. Supt. of the Minnesota division of the Northern Pacific, was on the train, and the accompanying illustration, Fig. 5, shows this train at work.

Figs. 1 to 4 showing the ordinary method of clearing drifts in hard snow are engraved from photographs taken on various sections of the Chicago & Northwestern. The engravings showing the operation of the Rotary snow shovel were made from photographs taken by Mr. Haynes, of Fargo, the official photographer of the Northern Pacific Co.

The construction of the Rotary is clearly shown in our illustration, fig. 6. A wheel 9 ft. in diameter is set in a round casing with a flaring square front 10 ft. wide and the same height, which feed the snow into the wheel. The wheel contains an inner and outer series of knives. These knives are pivoted on radial pins, and the surfaces of the knives being inclined to one another, as will be seen by reference to the diagrams figs. 7 and 8, the knives are canted when they encounter any snow, and are set so as to slice it off and feed it into the machine. Behind these knives and on the same shaft is a fan wheel composed of a number of radial blades. As the whole wheel is revolved at considerable velocity the centrifugal force causes the snow to fly to the out-

Fig. 3.

side of the fan wheel, and as the latter is surrounded by a casing the snow can only escape where an opening is provided for it. This opening is at the top of the wheel immediately behind the headlight. The opening is provided with a movable hood, so that the stream of snow can be regulated, and made to fly either to the right or left of the track.

In the diagrams 7 and 8, *A A* represents the casing, *B* is the shaft, *C, C* are the knives, and *D D* the fan blades. The manner in which the knives slice off the face of the snow drift and feed it into the fan blades by which it is whirled out of the top of the casing can be readily understood from the diagram. The knives and fan are shown revolving in the direction of the arrows shown in solid lines. The snow is then ejected to the right as shown. If it is desired to throw the snow to the left, the engines driving the knives and fan are reversed. The position then assumed by the knives is shown in dotted lines, and the course of the snow is shown by the dotted arrows. The reversing is very readily accomplished and is not often needed, but the use of this adjustment is evident. Should a wind be blowing across the track it would obviously be of little use to throw the snow to windward, and in sidelong cuttings any snow thrown against a hill would simply roll down again and refill the cut.

The fan wheel and knives are carried on a stout steel

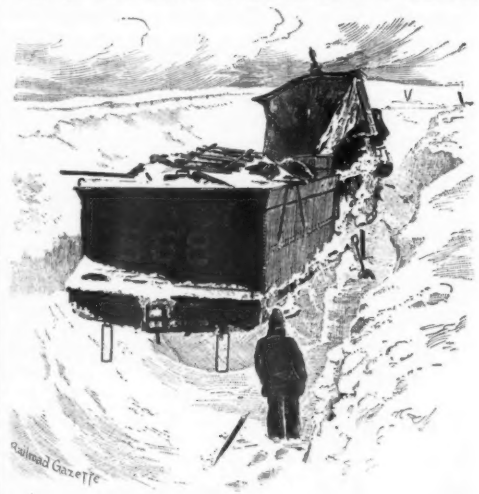


Fig. 4.

shaft and are connected by means of bevel gearing to a cross shaft which is actuated by a pair of 17 × 22 horizontal cylinders. These cylinders are fitted with link motion and

are got up much in the style of locomotive cylinders. They are supplied with steam from a locomotive type boiler, which has, however, more heating surface and a larger fire-box than is usual on locomotives. The wheel, the engines for driving it and the boiler for supplying steam are all mounted on an eight-wheeled car. The trucks, axles and framing of this car are of extra strength, the framing being composed of heavy I-beams and channel irons. The boiler and engines are protected from the weather by a strong house built over them.

The Rotary is under the charge of a pilot, who stands on a platform immediately above the bevel wheels and in front of the smoke-box of the boiler. By a system of signals he controls the engineers on the Rotary and pusher, and by a hand-wheel can alter the position of the hood that directs the stream of snow to either side. He has also charge of the ice breaker and flanger for cleaning the rails after the main body of the snow has been removed by the rotary.

The ice breaker is a stout blade of steel, hanging in front of the front wheel of the front truck, and so attached to the journal box and frame of the truck that it rises and falls with the movement of the front truck wheels, and consequently maintains a fixed position—about ½ in.—above the top of the rail. When nearing switches or frogs the ice breaker and the flanger which follows it can be raised several inches above the track by means of a steam cylinder, specially arranged for this purpose. The pilot has merely, by pushing a lever, to admit steam to this cylinder and the ice breaker and flanger are instantly raised clear of the track. Should, however, the pilot forget his proximity to switches, the gear holding the ice breaker in position is so arranged that should it strike an obstacle it is freed by shearing a bolt and allowed to pass over the obstacle without further damage. This bolt can easily be replaced.

The flanger, which clears out snow from both sides of the rail for a distance of about 12 in., is attached in a somewhat similar manner in front of the rear wheel of the front truck. It is stated that these devices work very successfully and that the rail is left as clean as it could possibly be made by hand labor, using picks, shovels and brushes. Even when the rails can be clearly seen, the presence of ice or packed snow flush with the top of the rail will greatly impede travel and cause the locomotive to slip, and therefore the value of efficient means of cleaning the rails is hardly inferior to that of the wheel itself, which clears away the great bulk of the snow, but, of course, leaves it an inch or more deep on the rail.

The eight-wheeled car as above described is followed by a tender carrying water for the supply of the boiler. These

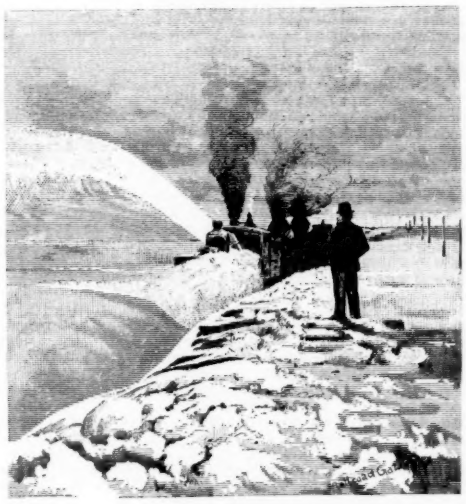


Fig. 5.

two vehicles are propelled into a snow bank by one or more engines as may be required according to circumstances.

All the Rotary steam snow shovels used in the United States have been constructed for the Rotary Steam Snow Shovel Co. by the Cooke Locomotive Works, of Paterson, N. J. The Canadian Pacific has bought the right to use the Rotary steam snow shovel for their whole system, and will build it in the railroad company's shops. The machine has now been adopted by all the Trans-Continental lines in the United States and Canada.

The following account of the performance of the eleven Rotaries at work during the past winter will be interesting:

One has been at work on the Southern Pacific, chiefly in the Sierra Nevada, and east to Ogden, Utah, three rotaries have been employed on the Union Pacific from Omaha west, including both the main line, the Oregon short line, the Utah & Northern, Wood River and Park City branches. On the latter lines very heavy service has been performed by the Rotaries for the past two winters. The Oregon Railway & Navigation Co. has used the Rotary to clear the line and it proved of especial service in a storm that lasted for ten days without cessation, the snow being blown down from the mountain sides in such quantities that for 35 miles the cut was filled within half an hour of being cleared. The trains were literally "convoyed" through, the passenger train following within about 50 yards of the shovel, and the freight trains following the passenger at a similar interval. In this manner traffic was run without delay or inconvenience, while in the winter of 1884-'5 the

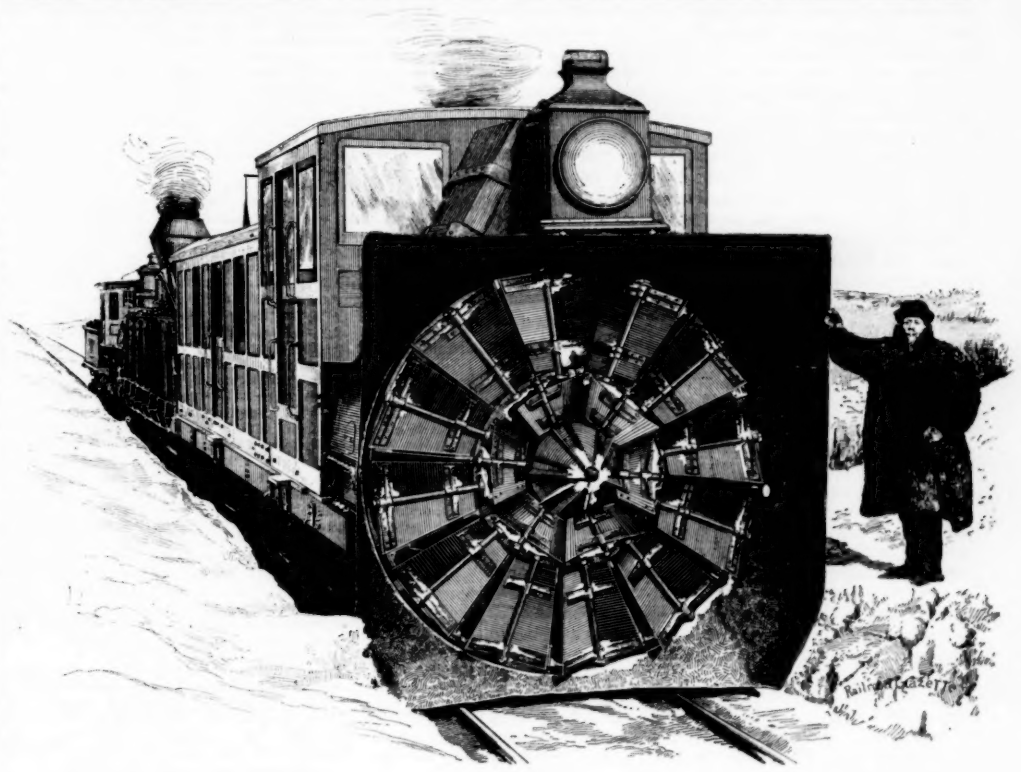


Fig. 6.

line was blocked for three weeks, two passenger trains being snowed in while endeavoring to force their way through drifts on the Cascade Mountain division. The passengers were supplied with provisions sledded for many miles over the snow. The difficulty and danger of sledding in such a wild and broken country over drifts, in some cases 40 ft. high, may be imagined but cannot be described. Even then the passengers were not rescued until the Northern Pacific sent a large body of men with engines and snow ploughs to dig the trains out. These men were part of the construction force of the Northern Pacific at that time. It is said that in raising this blockade over 20 locomotives were seriously disabled, being wrecked or thrown off the track in bucking the snow, while the rails on 60 miles of the track were "burnt" where the engines had slipped in pushing the old-fashioned wedge plow.

Four Rotaries were used on the Northern Pacific this winter. The first that arrived from the manufacturers was rushed to the front, and was sent to open the switchback line over the Cascade Summit, which had been blocked for nine days when the Rotary arrived. Mr. J. M. Buckley, the Asst. Gen. Man. and other officials of the Northern Pacific, were present when the switchback was cleared. The feat was accomplished in less than nine hours, being begun at 10:30 A. M., and finished at 7:20 P. M., though owing to the switchbacks, the Rotary had to be taken back to the foot of the mountain, several miles from the foot of the switchback, to be turned for the next switch. Just after the switchback was opened by the first Rotary (No. 1), the second arrived, after which one was put at each end of the train of locomotives, so that the switchback could be cleared without having to go back to the turn-table. The trains are worked in a similar manner, one engine being at each end of a train so that whichever way the train is running, the front engine is always pilot first.

The switchback was successfully operated during the rest of the winter from Jan. 2, the Rotaries keeping it open without any delay to the traffic. The difficulties of clearing this line were enhanced by the steepness of the grades, 296 ft. to the mile. An ordinary light passenger train requires two Consolidations, one at each end, while a heavy train is divided into two sections, two Decapods taking the heavy and two Consolidations the light section. Our readers therefore will not be surprised to hear that three Consolidations and one Decapod were required to propel the Rotary. This probably formed the heaviest train for its length that has ever

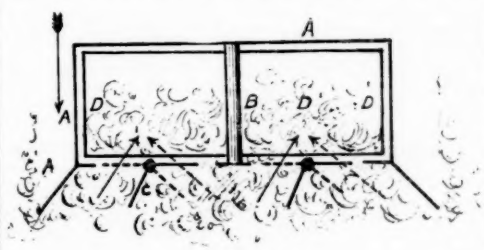


Fig. 7.

been regularly worked, and must have subjected the numerous high trestles on the switchback to a strain fully equal to that allowed by the designers of the best and latest steel bridges.

The fall of snow is so excessive in this region that the men and contractors who had been engaged in building the road laughed at the idea of keeping the road open with a rotary or any other form of snow-plow. While the cold is never very intense, seldom falling below zero, it is said that two feet of snow will often fall in one hour, and that such a storm will often last for several hours.

The third Rotary for the Northern Pacific was intended for the Rocky Mountain division, but never reached there, owing to the terrible storms which prevailed in Dakota when the Rotary arrived at St. Paul from the manufactory. The Dakota lines were completely blocked with snow and

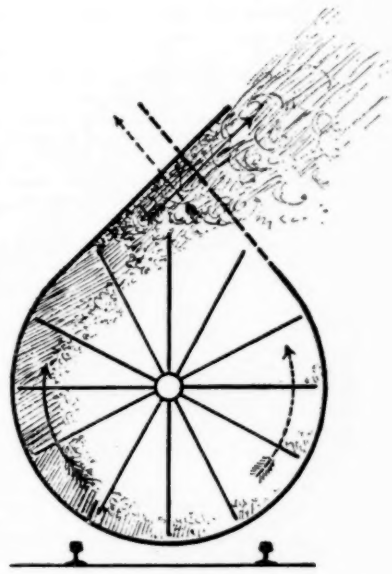


Fig. 8.

black soil blown in and frozen hard into a mass resembling sandstone rather than snow.

The following account of the performance of the Rotary is abstracted from an article in the *Minneapolis Tribune*, in which we understand the facts are accurately given, and were contributed by officers of the railroad who were present.

"One of the Rotaries started out in Dakota in the middle of January, after the terrible storm, and while the thermometer was still 30 degrees below zero. Sidings covered with from 1 to 3 feet of snow were first cleared, the Rotary being pushed by one American type engine. The next operation was to open the Northern Division from Jamestown to Minnewaukon. The first obstacle encountered was a cut filled with 12 ft. of solid snow, packed and frozen hard for a distance of about 25 ft., while for 100 ft. more the drift varied in depth from 1 to 5 ft. The Rotary was pushed by two 18 by 24 engines, but stalled after penetrating 5 ft. into the deep cut. On backing out it was found that the face of the drift on which the Rotary cutters had been working resembled polished granite in shine and consistency. The sides of the face were then shoveled down, and the Rotary, after repeated attacks, worked through the obstruction. An officer of the company who witnessed the first two trials returned to Jamestown and reported that they will not get to Minnewaukon in six weeks. As many as nine snow-plows belonging to the road had been smashed in trying to open the same cut in the previous spring, it did not seem unlikely that the new machine would also fail. But within three hours the cut was opened, and another cut 500 ft. long and varying from 2 to 8 ft. deep had also been cleared and an

abandoned and buried train had been disinterred. This train was taken back to Jamestown, and the Rotary started again next morning, making an advance of 46 miles during the day. Two cuts, 600 and 800 ft. long respectively, blocked with snow from 2 to 8 ft. deep, were cleared out. In the deepest parts the snow was packed solid and frozen hard But, notwithstanding this, the worst cut was opened in 50 minutes. On a previous occasion when this cut was opened by an ordinary snowplow 35 shovelers were employed and 11 hours were consumed in opening this cut. It is found that where the snow is not hard packed—of the consistency where an ox can walk on it without sinking in more than 2 inches—the Rotary will clear out snow 10 to 12 ft. deep while moving two or three miles an hour."

The fourth Northern Pacific Rotary, which was the last to arrive from the factory, was intended for the Dakota division, but owing to the lines in Minnesota having become completely blocked for weeks before its arrival it was retained on the Minnesota division, and was employed in clearing the various branches in Minnesota, which was successfully done, and during the cessation of storms in February the Rotary opened and cleared as much as 650 miles in four days, Mr. Root, Asst. Supt. Minnesota division, and other officers accompanying it on this trip. During another cessation of storms in March, equally good work was done in clearing roads that had been blocked by previous storms. During all these operations in Dakota and Minnesota, in which many thousands of miles were cleared, no engine was disabled and no person was injured, while it is stated that during the preceding winter some 32 locomotives were disabled and wrecked on these divisions in simply opening the lines after they had been blocked all winter. The Brown's Valley branch of the St. Paul, Minneapolis & Manitoba was completely blockaded all the winter, only one train having been able to force a way through by the aid of shovelers, progressing a few miles a day, and that only when the weather was favorable. This train carried provisions for the inhabitants and Indians, who were in great distress. This is one of the many instances of lines being completely closed for traffic during the whole winter.

The Colorado Midland also used a Rotary, which proved more economical in operation than the old method of clearing snow. This road was, we understand, kept clear solely by its use, the ordinary plows not being used after the Rotary had made its first trip. This line has been operated this winter without the omission of a train, a feat which, considering the height of the summit, 11,000 ft., was previously deemed impossible.

The Chicago, Milwaukee & St. Paul secured the last Rotary built. This was placed at Chicago on trial in order to give the officials of Chicago roads an opportunity of seeing it work without going to the Northern Pacific. Its trial trips were made on the lines of the Chicago & Northwestern and the Chicago, Milwaukee & St. Paul, and it was bought by the latter company. It raised several blockades. One portion of the Winona & St. Peter Division of the Chicago & Northwestern, which had been blocked for three weeks, was opened in one day, a feat that had never been previously accomplished.

On the 16th of March the Rotary which had been built at the Polson Iron Works in Toronto made a trial trip on the Northern & Northwestern of Canada, and cleared a blockade which had stopped traffic on the Beeton branch. Three freight engines were used as pushers and a drift from 10 to 12 ft. deep, which an ordinary plow had failed to get through, was cleared. It is stated that the snow was thrown as much as 200 ft. into the adjoining fields, clearing the fences and flying over the telegraph wires. The blockade extended over a distance of 20 miles, the snow lying from 2 to 12 ft. deep, but this distance was cleared in 2½ hours, actual working time.

Steam Heating—New England Railroad Club Meeting of April 11.

President Mr. J. N. Lauder announced as the subject for discussion for the evening "The Heating of Passenger Cars by Steam," and stated that it would be opened by Professor Lanza, of the Massachusetts Institute of Technology.

Professor LANZA: The reason, doubtless, why I have been asked to open this discussion, is on account of the investigation which I have been making for the Railroad Commissioners in regard to heating cars by steam from locomotives.

This investigation has had two objects: One, to collect, for the information of the Commissioners, the experience of the roads, mainly of Massachusetts, with the appliances which they have had in use during the last winter, to ascertain what difficulties they had met with, and what on the whole has been their success with them. The other object was to determine, approximately, the amount of steam used in heating passenger cars. I shall speak first on this last branch of the subject, inasmuch as that is a matter in regard to which I have been making some experiments.

As to the importance of the question of determining the amount of steam used, there have been made and constantly are made, very varing statements in regard to the matter. On the one hand you will hear it stated that the amount of steam required to heat passenger cars is entirely inappreciable, some going so far as to say that all the steam desired for this purpose can be obtained through a hole larger than a pin hole in the boiler. On the other hand you will find it as positively stated that the locomotive cannot make its time if it has to heat the cars, and therefore fast trains cannot be run if the cars are to be heated by steam. I was statements of this kind that led the Commissioners to direct me to make some experiments to determine, approximately, how much steam would be required. On looking the matter over, the most natural way seemed to be to weigh the drip or condensation. But there are two serious difficulties in attempting to do that: First, that in order to get a result which we know is correct, we must have not merely a practically tight coupling,—one good enough for ordinary service not being good enough for this purpose,—but we should have a coupling so tight that we could wrap about it a piece of hair felting, and find it not even dampened at the end of a long journey. Supposing that it is desired to know the amount of steam used between eight and nine o'clock on a certain day, it is necessary to know one of two things; either that there is no condensed water in the water pipes when the observation is made at eight o'clock, and also at nine, or that the amount of condensation is the same at one time as at the other. The great difficulty of securing these conditions rendered it necessary to abandon any attempt to weigh the condensation, and the only way seemed to be to have recourse to the locomotive and ascertain how much steam passed from the boiler into the train pipe, and that course was followed in these experiments.

These experiments were not started very early and consequently not many were made, and not in the coldest weather, though some were made when the weather was fairly cold. Also, there was only opportunity to make them upon one road. In this connection I wish to thank Mr. Lauder, of the Old Colony road, who put at our disposal the boat train, which had six steam-heated cars, but is usually run with four, and gave us the privilege of making all the tests necessary and of using the engine of that train, which carries ordinarily, 170 lbs. pressure.

Not knowing of any steam meter on which dependence could be placed, an apparatus was constructed similar to that used at the Institute for a like purpose, consisting merely of two lengths of 6-in. flange pipe, bolted together, with a brass disk between them and a brass disk at each end, the two pipes being each about 2 ft. in length. This was placed beyond the reducing valve in the train pipe, the steam entering from the pipe beyond the reducing valve into one end of the apparatus. In the centre disk there was bored a 2-in. hole, and some nicely-made orifices were inserted there. The steam passed thence into the other chamber, and thence to the train; so that the steam had to pass through this apparatus and then on through the train pipe to the train. Then a gauge was placed on the train pipe and on each end of the apparatus. The reducing valve was not used, but merely a throttle valve, and the experiment was carried on in the following way: The pressure of the steam on the train pipe was regulated to correspond to that which the engineer would ordinarily use in heating the train.

The boiler pressure naturally varied more or less during the run, and the steam was throttled before reaching the apparatus, so as to give us 100 lbs. in the first chamber; the pressure in the second chamber was varied so as to produce 40 lbs. on the train pipe. The pressures in each chamber and also the boiler pressure were read every five minutes during the test. Now to determine from those two pressures how much steam had passed through the orifice, the engine was placed in the round house, where there were two large barrels half or two thirds full of water, on platform scales, and instead of delivering the steam into the train it was delivered into a pipe which connected alternately with one barrel and with the other, the former train pressure being maintained in this pipe by throttling, and precisely the same conditions were copied in the round house that were had on the train during the run, and the condensation weighed. It does not seem to me that steam heating is yet sufficiently developed to render it worth while to attempt to determine the relative amount of steam used by this, that or the other apparatus. The object set before us was to determine whether the amount of steam used is a tax upon the engine or not, and the experiments were sufficiently accurate for that. For very accurate experiments it would be necessary to determine the quality of the steam in the boiler, and to observe other nice conditions which it was unnecessary to attempt in this case.

I have here the result of the experiments, of which five were made, one on heating up, and four in running. The boat train on which these experiments were made usually consists of four steam-heated cars, the first being a combination baggage and second-class car, the next a smoker, and then two passenger cars, the parlor cars not being steam heated. The train leaves the yard at South Boston about 5 o'clock in the afternoon, goes to the Old Colony depot, leaving there at 6, having then two other cars placed between the locomotive and the baggage car, one a platform car and the other a box car, under which the main steam pipe passes to reach the steam-heated cars. There is the same arrangement in coming up from Fall River in the morning.

In the first experiment, steam was let on the train, with nothing between the engine and the four cars, at 3:08 p. m., the criterion of when the train should be sufficiently heated, being the time when the fourth car should have a temperature of 67.5 deg. Fahrenheit. It took 1 hr. 23 min. to accomplish that. The outside temperature was 27 deg., the amount of steam used was 386 lbs. during that time.

The second experiment was made the same afternoon in going from Boston to Fall River. The average temperature outside was 27 deg. The train started at 6 and reached Fall River at 7:25, the time being 1 h. 25 min. As far as the experiment was concerned, reaching Fall River meant reaching the time when the engineer turned off the steam from the train, which may have been within five minutes of Fall River. The steam used was 474 lbs. on the average, or 334 lbs. per hour. During this test the temperature of the cars was so high that the ventilators had to be open a good deal, and the cars were really too much heated.

The third test was in coming up from Fall River in the morning to Boston. The outside temperature was 27 deg. The train started at 5:35, reaching Boston at 7:00; time 1 h. 25 min. The steam used was 434 lbs., 306 lbs. per hour. On that occasion the cars were very well heated, but not as hot as the evening before.

The fourth experiment was made on another day, in going from Boston to Fall River, with five steam-heated cars instead of four. The outside temperature was 30 deg. The train started at 6, and reached Fall River at 7:17, time 1 hour and 17 min.; steam used, 419 lbs. or 326 lbs., per hour. The weather was warmer outside than before, and the train was not sufficiently heated. The engineer was asked how much pressure should be put on, and his judgment was to put on 40 lbs. The cars were cool, and we should have signalled for more pressure, but the signaling apparatus was out of order.

The fifth experiment was made the next morning on returning from Fall River to Boston. The average temperature outside was 19 deg., the lowest being 14 deg. The train started at 5:20, and reached Boston at 6:50, time 1 hour and 30 min.; steam used 570 lbs., or 380 lbs. per hour. In that run the train was cold; we had not pressure enough on, and as the last car rolled into Boston its temperature was 57 deg. There was no means of signaling to the cab for more pressure.

These experiments show that any one who takes the extreme ground in either way is mistaken; that to heat up passenger cars a certain amount of steam is required, commensurate with the heating to be done, and it is neither an inappreciable amount, nor a very excessive amount; and that as a rule it would not interfere with the running of the locomotive; there might be an exceptional case in which it would. It must be said also (I am indebted to Mr. Lauder for this argument) that during the time when the steam is most needed for heating, in the coldest weather, it can be best spared from the locomotive, because then the traffic is usually the lightest.

Before the experiments mentioned were made, a preliminary test was made to determine what size of orifice should be used in the apparatus. We started out, the temperature being somewhere near 25 deg. or 27 deg. F., with an orifice of one-eighth of an inch. It became almost immediately evident that it was impossible to heat the train with it, or to get more than 5 lbs. pressure on the train pipe, where 40 was needed. A half-inch orifice was substituted the next morning, and it worked well in all the subsequent tests.

With regard to the other side of the question, the experience of different roads with steam-heating apparatus, I move that the following order be adopted in the discussion, taking up the separate subjects in detail: First, the steam coupler; second, the reducing valve; third, the trap; fourth, the main pipe; and other pipes and valves connecting; fifth, the use of live steam, exhaust steam and water; sixth, the auxiliary boiler under the cars; seventh, care of the cars when stored away; eighth, individual heaters. I move that the subjects be taken up separately, perhaps that of couplers first (motion carried).

The PRESIDENT: We will now take up the question of steam couplers.

Mr. JAMES EMERSON: We have been using steam for heating our cars for seven years, with a boiler under the cars, and have had no trouble with it, and can measure the water at any time. We have tried many different couplers, and find that we succeed best with a smooth coupling with as little hose as possible, 18 in. answering every purpose. We use about five gallons of water per car per hour for heating.

Mr. EDWARD E. GOLD (Gold Car-Heating Co. of New York): I have our coupler. It couples by sliding together, making a perfectly tight joint, and when the cars pull apart it straightens out and separates. The hose is 1¼ in. dia. steam hose, five-ply, will stand a pressure of 200 lbs. per sq. in., and is guaranteed to last six months under a continuous pressure of 25 lbs. per sq. in. The hose is fastened to the coupler by a simple screw that holds it perfectly tight. Both parts are exactly alike and interchangeable. There is a trap to let out the water—a simple check valve; when the steam is turned on the valve is closed, and when the steam is removed it opens and lets out the water, and cannot freeze up. This trap is adapted to any other coupler, or can be placed on any part of the supply pipes. It has been tested on the New York Elevated roads and found satisfactory.

Mr. MCELROY: Our coupler has been used on the Delaware & Hudson, and on the Wagner vestibule trains between New York and Chicago. It is simple, the two parts alike, and is locked by double cams, the two cam rings being provided with handles. The joint is tight with 100 lbs. of steam. When the cars pull apart it disconnects automatically. It is so arranged that it does not form a pocket for the water condensation to stand in, and no trap on the coupling is necessary. This coupler is provided with a gasket, made of canvas and a small amount of rubber. We have used them continually since early in January, and not in a single instance has the gasket been taken out, the coupler standing tight, there being no escape of water from it. The wearing of the packing is provided for, and you have a tight joint all the time.

Mr. SEWALL: A coupler to be what its name would imply must of necessity be always tight, must wear so that its ability to become interchangeable is not interrupted; it must have no parts that are liable to derangement; it must be practically in one piece, and its wearing surfaces must be so arranged that the wear will not affect the steam joint. In our coupler, the two halves being alike, if one part in use five years be presented to another part never used, they will couple and be tight. The construction is very simple, with no delicate mechanism to get out of order. It has a straight passage through it; turns or crooks mean resistance, and resistance is a thing to be avoided. Traps are considered unessential with this coupler.

Mr. CHASE (Williames Heater Co.): The position in which the coupler is placed has much to do with the 40 or more lbs. of steam which has been indicated as required to heat four or five cars. We can heat five or six cars with a great deal less pressure than that. In order to do that I place my coupler as high as possible, and as near to a horizontal line, to prevent a pocket between the cars. I admit the undesirability of a lever to lock the coupling, but there are many less desirable features than that, and I prefer the lever if by its use I can reduce the pressure from 40 lbs. to zero. I prefer the lever to a deep pocket which shall hold the cars together without it, which condenses the water, and then pressure of steam is required to keep the water out. The size of the opening has much to do with the pressure required to heat cars by steam. My coupler has a 2-in. opening without any obstruction, and it has remained tight, even with the poor gasket that I use, under the pressure required to heat 14 cars. We are now working on a modification of the coupling which will bring the two parts together without any sliding or twisting motion, without any drawing out of line more than ¼ in. in any direction. We have been able to heat six cars to over 100 deg., taking the steam into all the cars under conditions that would give us the most possible condensation, the doors and ventilators open, and under each seat an opening 3 by 4 in., and eight openings 6 in. square, and yet our train pipe was free of water owing to the way the coupler is put together and where it is placed. We tried various ways of placing the coupling, and finally got it up to within 1 in. of the draw-bar, which we find the best place for it.

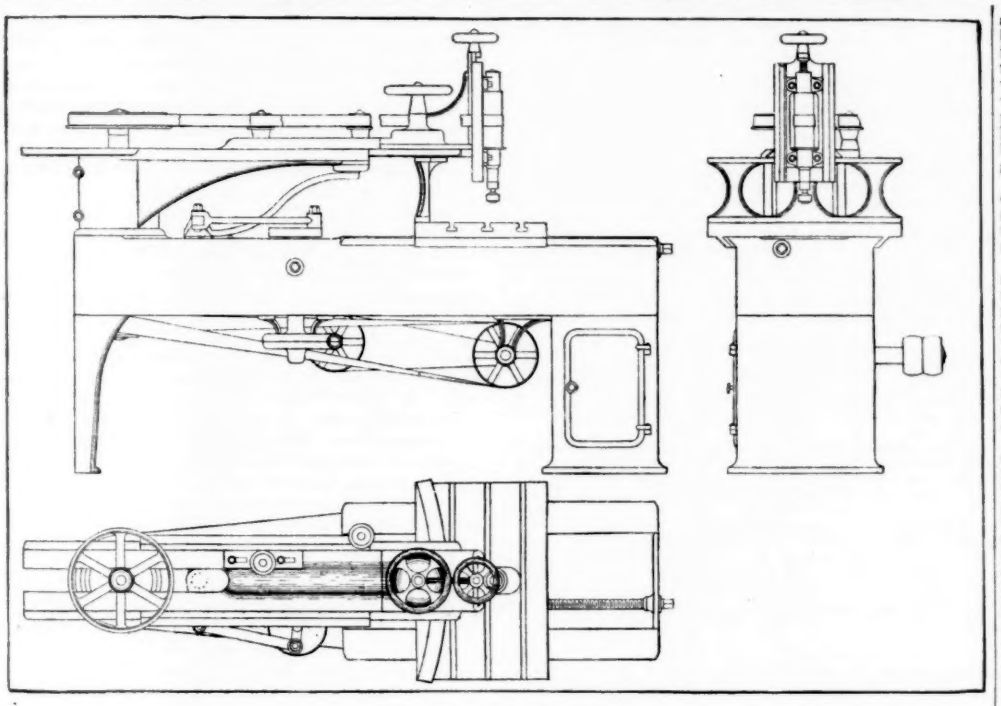
Dr. J. B. PORTER (University of Cincinnati): The deepest centre that I have ever noticed of any coupling was about 18 in., and that is equivalent, if you allow the greatest possible resistance to the water, to only about ¾ lb. per car, and therefore the additional steam pressure necessitated by the sag of the couplings would amount to very little and not be a very important element in the amount of pressure on the pipe necessary to carry.

Mr. CHASE: If this pocket between the cars has so little to do with it, where comes in the necessity which Prof. Lanza has indicated for 40 lbs. pressure, or more than that, as in some cases where cars are heated by steam? We have proved that we can heat the cars without the 40 lbs. pressure, or without 10 lbs., and I have heated six cars to over 100 deg. and did not have on over 2½ lbs. per sq. in. during the day at any time, and have heated the same cars using only the exhaust steam. Now, what is the necessity for 60 and 75 lbs. pressure? I say that the pocket is one reason for it, and I say get rid of the pocket, even if you have to put in a lever.

Prof. LANZA: I would like to ask Mr. Chase how much of his small pressure he attributes to the absence of a pocket in the coupling and how much to other things?

Mr. CHASE: I have made no experiments to show what proportion was due to the coupling. I get a lower pressure by the use of my 2-in. pipe, which is the largest I can use; if I could use a pipe of any size I presume no pressure would be needed.

Mr. F. D. ADAMS (Boston & Albany): I think it is understood among practical railroad men that the coupler in a steam-heating system is one of the important elements. Whether or not it has anything to do with the pressure of the steam used, it is a necessity to have a uniform coupler at the earliest date, as we know by experience the disadvantages of having a variety of couplers. For ten years the Master Car-Builders' Association has been struggling with the question of car couplers, and perhaps we shall be ten years more in striving to get our cars coupled together under the steam-heating



LINK GRINDING MACHINE.

Made by MESSRS. PEDRICK & AYER, *Philadelphia, Pa.*

system, if we do not come to a conclusion at an early period and unite upon a heater coupler that is practical in all its details, perfectly simple, and will accomplish its end with the least trouble and expense. I have had a favorable impression of Mr. Sewall's coupler, but I think I have seen a better one, and I don't hesitate to say that I was unusually well pleased with Mr. McElroy's, and I hope the railroad men will examine it. The Martin coupler which we have used is subject to a good deal of wear, and leaks considerably, and we are not fully satisfied with anything we have tried yet.

Mr. BLACKALL (Delaware & Hudson): We have used the McElroy coupler since the latter part of January without a single leakage, and I think if railroad men will try it they will not discard it.

The PRESIDENT: We have used the Sewall coupler on eight cars for two or three months, and as far as I know it has given no trouble. We have one very sharp curve, where the coupler will be strained enough to leak a little, and in such a case it has to be thrown down by hand, but when thrown into place it is practically tight. The Gold and the McElroy couplers are practically tight.

Mr. Temple presented a model of a steam heating apparatus in use on the Chicago, Milwaukee & St. Paul, and explained it, the chief merit of the system being the preservation of a uniform temperature in the cars whatever the temperature outside.

The subject of the reducing valve was then discussed. Mr. Chase, of the Mason Regulator Co., explained some improvements which had been made in their valve, and stated that out of 450 sold, three only had been returned. The President said the valve had been used on the Old Colony to some extent with good success. Mr. Stone stated that he had used it and other valves, and found the Kelly valve superior to any other.

The subject of traps was then discussed, the President expressing the view that there is no trap in use capable of taking care of the condensation properly on a steam-heated train.

Mr. TEMPLE described the electric trap, which retains no water of condensation, and cannot freeze.

Mr. CHASE stated that the Williames system of heating required no traps whatever.

Professor LANZA: Traps usually do not act promptly enough, or else when the car is put away the slow drip freezes it up, and steam cannot be again run through the pipes until it is thawed out. Why cannot a trap be placed inside the car? An arrangement on the Atchison, Topeka & Santa Fe seemed to remedy the difficulties pertaining to traps. The whole circulation was drained into a small metallic box, put into the floor of the car between the sills, the condensation falling into the box, from near the bottom of which leads a 1-in. pipe up into a tank which is placed part way up in the car, the action of the apparatus being as follows: At first the whole system is filled with steam; as soon as condensation occurs water collects in the box, and when it has covered the lower end of the pipe the steam in the tank being separated from that in the circulation, soon acquires a less pressure, and the excess of pressure in the circulation forces the water up into the tank. The condensation water is thus carried in the tank to the end of the route, where the whole is let out, by opening suitable valves in box and tank. This might be called a method of putting the trap inside the car.

Mr. MCELROY described the trap in his system as placed under the seat in the car, the water condensation being discharged automatically at a low temperature, the heat of the trap and connecting pipe being utilized in warming the car.

Mr. BUTLER called attention to the trap in use on the New York, Providence & Boston, which has given satisfaction.

Mr. GOVE referred to the trap used in connection with his heaters, which is placed in the car about 3 in. above the heating pipes.

The further discussion of the subject was postponed to the next meeting.

Link Grinding Machine.

This machine is the invention of Byron E. Parks, of Big Rapids, Mich., and is built by Messrs. Pedrick & Ayer, of Philadelphia, Pa., and is designed to quickly and accurately fit up hardened links and blocks.

Links are generally sprung out of truth in the process of case hardening, and therefore require subsequent grinding. When ground free hand the usual way, the space and block are ground so as to work freely, and the true radius is often lost. It is claimed that with this machine any radius can be quickly ground true, and either the block, link or face of the link can be properly surfaced.

The machine consists of a frame, carrying an arm mounted with an emery wheel, which has an automatic feed up and down, exposing all the surface of the wheel to the work, keeping the wheel true. The wheel has an automatic swinging movement, the arc of the circle to be ground. The machine is driven by an overhead counter-shaft not shown.

The operation of the machine is as follows: An annular grinding wheel is placed in the machine spindle and the sides of the link are ground true and parallel and of an equal thickness. The faces of the link saddle are then ground true and square with the saddle-pin. The two parts of the link are then bolted together, the end blocks being left out, so that the centre of the grinding wheel can swing past the clearance space at each end of the link. The sliding arm is then set by the graduations, so that the centre of the grinder spindle will swing in an arc, the radius of which shall be the radius to which it is desired to finish the link being operated upon. The link is then adjusted on the platen of the machine, so that the centre line of the opening or slot will coincide with the centre of the grinder spindle, after which the platen should not be moved while finishing the curved surfaces of the link, but all adjustment should be made by the swinging arm, the platen remaining stationary.

One of the curved surfaces is then ground with an emery wheel slightly smaller than the opening in the link. The distance required to move the grinder beyond the fixed centre line to finish the surface is noted by the graduations on the arm. The grinder is then brought into contact with the opposite side and finished to the same distance from the centre line. The work should always be done to equal distances each way from the centre line of the opening in the link.

The link block may be ground to fit by substantially the same methods employed in finishing the link, setting it to the same radius and finishing to equal distances each way from the centre line, as already explained.

Western Railway Club.

The regular monthly meeting was held at the Grand Pacific Hotel, Chicago, April 18, Vice-President Verbryck in the chair.

The first topic was

DRAFT APPLIANCES OF LOCOMOTIVES.

Mr. F. C. SMITH, Peoria, Decatur & Evansville, presented the following paper:

There are, undoubtedly, many roads in this country which are, like the road I am connected with, equipped with the American type, or eight wheel, engine for freight service. These engines are 17×24, 8-ft. side rod, and diamond stack.

In buying such engines, general managers—who have so much to say—are too often led to purchase the lowest priced engine of several bids, when the sizes of the cylinders are the same. In other words the engine is rated by the size of the cylinders alone. This generally results in a pair of 17 × 24 cylinders on a boiler barely large enough to make a good 15 × 24, while the weight on the drivers is as much deficient as the boiler.

One hundred and sixty flues and a 66-in. fire-box will not furnish steam for a pair of 17 × 24 cylinders when worked at all hard, nor is 10,000 lbs. per driver sufficient for adhesion, with 60-in. wheel. There is a constitutional blemish in all such engines which can only be eradicated by larger boilers and more weight on the drivers. But, like a consumptive human patient, such engines may be—if not too far gone—doctored into better efficiency.

In order to determine how much such engines could be helped, seven diamond stack engines, with plain fire-boxes, were thoroughly overhauled and a close record kept of their performances based on the number of loaded cars hauled one mile for each ton of coal consumed.

These engines than had a 30 in. extension added, with single nozzles 4⅝ in. in diameter, a stack of the straight shot order, and designed on the ejector principle, that is, 22 in. opening into the arch, tapering for 16 in. to a diameter of 13 in., and then enlarging to a 15-in. opening at the top. Two and one-half by two and one-half mesh netting was used, a brick arch, supported on pipes, fitted to the fire-box, cast iron running boards 4 in. thick, a cast-iron ash pan 2 in. thick, a false deck 5 in. thick, and a lagging of cast-iron on the wagon tops added for weight. When tested in the same service an increase of 21 per cent. in the number of cars hauled per ton per mile was the result. The fire-boxes were also lagged with wood on the outside. I believe this is all that can be done to improve the average eight-wheel commercial engine.

In passenger service, where an absence of smoke and cinders is desirable, the extension front alone is of little service, and yet many roads use the extension arch alone without the brick arch, which is unquestionably one of the best modern devices added to American engines.

The road with which I am connected runs through the same section of country as another road, which has so far failed to use the brick arch on the grounds that it is destructive of fire-box side sheets. The officials of that road warned me that brick arches would not work with the water used. But we have no trouble whatever. When brick arches are placed close to the side and throat sheets overheating of these sheets will occur, but if kept 4 in. from the side sheets and 6 in. from the throat sheet no trouble results. Why the brick arch should have such a limited use is not clear, unless it be due to an over conservatism and a fear of trying something new.

With a properly designed extension front end, a brick arch and a sufficient number of hollow staybolts 16 in. above the grates, any passenger engine may be made practically free from smoke and cinders. The hollow staybolts are of great importance, in that a good portion of the air needed for combustion is supplied above the fire, thus decreasing the amount and velocity of that drawn through the fire. The result is that fewer sparks are dragged from the fire, and those which are lifted are largely caught and detained on the rough lower face of the brick arch and burned. An engine thus equipped and fired with not over two shovels at a fire with soft or bituminous coal, and hauling five or six passenger cars, will show absolutely no smoke and throw no cinders. The extension arch need never be "sparked" at terminal points if provided with a straight 16-in. pipe, fitted to the bottom of the extension and extending down through the front and apron to within 8 in. of the track. The bottom of this pipe being fitted with a flat sliding valve, operated by a lever from the cab, will, if opened every 25 miles, after the engine is shut off going into a station, empty the extension and trail the cinders along the track.

It has been shown by Siemens, the inventor of the open-hearth furnace bearing his name and so largely used in steel making, that no flame can exist in actual contact with a surface colder than itself, and that in the reduction of metals far better results were obtained when the flame gave up its heat to fire brick, which was then radiated on to the metals to be reduced. This is undoubtedly the explanation of the better economy due to the brick arch in the locomotive practice. The arch, being a non-conductor, becomes highly heated because the flame may actually come in contact with it, while the same flame could never actually touch a side sheet. The arch, becoming white hot, not only radiates its heat to the fire-box, but in addition, when a proper amount of air is admitted to the fire-box, ignites the gases given off from each fresh fire, thus burning them in place of allowing them to be cooled down and become visible as smoke.

It would seem, therefore, if the brick arch were fashioned so that its lower face were a half circle or a V shape, that it would be in a better position to radiate its heat than when, as at present, its lower face is flat.

The diameter of the stack when of the straight shot order has much to do with the diameter of the nozzle and the freedom from smoke. Nozzles are ordinarily reduced to make an engine steam better. This result is accomplished by the greater velocity given to the exhausted steam, which in turn creates a better vacuum in the arch, and in consequence draws more air into the fire, which burns more fiercely and generates more steam. Now, the exhausted steam may practically be given a higher velocity by compeling it to escape through a smaller stack. The result is a better vacuum in the arch, and the engine steams better, having the nozzles, as is desirable, of as large diameter as possible. While connected with the Cincinnati Southern road, under the instructions of James Meehan, general master mechanic, the writer made many experiments with nozzles and stacks, and in every case the narrowing of the stack from a diameter, originally that of the cylinder, showed, by the vacuum gauge attached to the arch, better vacuums by from 20 to 40 per cent., while the engines showed less smoke, due to the greater quantity of air drawn through the fire, the engine, of course, steaming freer.

The diamond stack is notoriously a smoke trailing device, due undoubtedly to the fact that the diamond top acts like a "cut water" to lead the wind up to and straight back across the top. For this reason the straight shot stack, which has no ornament at all at the top, is the best, because the squarer and bluffer front it presents, the more the air recoils and takes an upward direction and not straight across the top, and in consequence the less smoke is trailed.

Messrs. Bryan, Sinclair, Hickey, Gibbs, Wm. Forsythe, Foster and Sprague took part in the discussion which followed.

Mr. GEORGE GIBBS, Mechanical Engineer, Chicago, Milwaukee & St. Paul, then read a paper on

LESSONS OF THE WINTER IN STEAM HEATING OF RAILROAD CARS.

Following is an abstract: At the close of the winter we can profitably study the results of experiments in this subject, which has now been set squarely before us. It need hardly be said here that a single prearranged test of a new device is not necessarily a demonstration of its practicability. This is especially true of a steam heating system, which is liable to quick destruction from neglect, exposure and rough usage. Defects in a device arising from lack of experience in its use are easily remedied, but the inherent ones have to be met in a different way. The requisites of a practically successful steam heating arrangement for railroad cars are: First, that it shall be capable of supplying sufficient heat under the most extreme circumstances; second, that the heating power may be graduated to suit conditions of weather; third, that this shall be accomplished preferably automatically, or, if not, with a minimum of attention, and that unskilled; fourth, that it shall be simple, easily kept in order and not liable to derangement by freezing; fifth, that warming before making up of trains at terminals may be readily accomplished. To these might be added the desirable condition that it provide for healthful ventilation.

The first condition is easily fulfilled by merely introducing the requisite amount of heating surface, and it may be said here that a large excess will be found desirable, as regulation is not difficult and it will facilitate the rapid warming of the cold cars at terminals. We have found 200 sq. ft. in a 50-ft. coach not too much, and with this the coach can be made habitable in one hour in the most extreme weather. With the excessive amount of heating surface necessary in cold weather some provision for graduation becomes absolutely necessary in mild. Both throttling the steam admission or complicated graduated inlet valves for this purpose, require too delicate manipulation and constant attention.

The third means is by cutting off entirely a portion of the heating surface in mild weather. This we have employed, cutting out the side piping on truss planks, leaving the box coil in direct radiation at the ends of the car undisturbed. But automatic regulation provides the only perfect solution of the problem as far as comfort goes. Trainmen whose duties require them to be alternately in and out of the car are incapable of judging temperatures correctly. The additional complication and expense entailed by its use are of course the only drawbacks. I am convinced, however, by some experience we have had in this direction, that the difficulties are not insurmountable and that the saving of steam consumption by its use will repay its cost and make the heating of long trains more feasible. The vital conditions of a successful steam heating system are, however, stated in Condition 4. Simplicity and ready accessibility to all parts are essential when we consider that its manipulation is in the hands of trainmen unskilled in the science of steam engineering, and who cannot at first appreciate the weak points. Then, too, repairs will be frequently necessary from the nature of the service and must be made quickly on the road.

The liability of water to freeze is after all the key to the situation. I do not wish to magnify the danger from this cause, but I think it would have been instructive to those who underrate it to have witnessed our experience during the extremely cold weather of the past winter with steam-heated trains on a through run of over 400 miles daily. One arrangement after another, many of which are to-day confidently put forward by steam heating companies as parts of "the only successful system in existence," was abandoned as either a failure or a scheme requiring special attendants to keep it in operation. It is not necessary to rehearse our experience in detail, but the lesson taught was, avoid all multiplication of traps and valves, do away with drainage cocks making drainage positive towards one point, which should be the lowest in the system and provided with a reliable trap or open vent; have no pockets whatever to catch condensation, either at coupling or in train pipe; use no pipe or valve of less than one inch diameter, preferably not less than 1¼ in. where exposed outside. The main train pipe should be at least 1½ in. in diameter, and if space can be spared two inches is better. With large pipes expansion becomes a serious matter on account of their rigidity, and due allowance should be made at all points for this. Our experience and observation of other methods have convinced us that rubber hose connections for obtaining flexibility between cars are the best, and can be relied upon, with low pressure, to last one season when made of the proper material. For warming cars at terminals we have made use of stationary boilers and steam heating plants, and propose to extend the plan to making convenient platform connections at all points where service requires.

The storage of heat in case of a break-down is considered by some necessary. It would certainly, at times, be convenient, but the means of accomplishing it are not obvious Hot water, brine and other liquids, I consider an unmitigated nuisance, bearable in the case of sleeping and other special cars with regular attendants, but not to be thought of for the entire passenger train equipment. I believe the retention of one or two coal stoves in the car for emergency covers the case fairly well.

Experience this winter with coaches well ventilated by the introduction of warmed fresh air has convinced us that this condition is simply accomplished by steam heating system It will be seen from the above that the subject is not free from complication, that difficulties will continue to be met with in practice, some of which can be remedied by careful designing, others which are inherent and will require watchfulness on the part of attendants to prevent failure when heat is most essential.

Messrs. Bushnell, Smith, Hickey and Sinclair joined in the discussion.

It was announced that at the next meeting of the club an attempt will be made to agree on a standard axle for a 60,000 pound car for recommendation to the annual convention of the Master Car-Builders' Association.

Two Cents a Mile for Commercial Travelers.

We give below some extracts from some remarks made by Oscar Townsend, General Manager of the Cleveland, Lorain & Wheeling R. R. Co., before the Senate Committee on Railroads of the Ohio Legislature:

I appear as General Manager and on behalf of the Cleveland, Lorain & Wheeling Railroad Company, owner of a railroad extending across the state of Ohio from Lorain on Lake Erie to Bellaire on the Ohio River.

My attention has recently been called to Senate Bills No. 1 and No. 2 to amend certain sections of the statutes of Ohio, and about the same time I received a letter from an organization styling itself "The Travelers' Protective Association," which appears to shed some light upon the source of this proposed legislation. * * * I will, with your indulgence, read the letter.

"On the first day and almost the first hour of the Ohio Legislature the following bill was introduced, viz.:

"A company operating a railroad in whole or in part in this state may demand and receive for the transportation of passengers on its road a sum not exceeding two cents per mile, but the fare shall always be that multiple of five nearest reached by multiplying the rate by the distance, etc. Other states will introduce similar bills and our friends in the U. S. Senate and House of Representatives will endeavor to amend the Inter-state Commerce law in our behalf. It is perhaps unnecessary to remind you that this question is being agitated by the Travelers' Protective Association of the United States. As before stated a joint 5,000 mile interchangeable book at two cents per mile would be satisfactory to the commercial interest of the country, and would not be purchased to an extent except by commercial travelers. We would protect you from abuse of the privilege by signature, photograph, registry number, or in any other reasonable manner you may suggest."

The opening sentence of the letter appears significant. * * * Why write such a letter to any railroad officer? and why to the C., L. & W. road? That company had, for several years, been selling 1,000 mile tickets at two cents a mile, to establishments requiring the services of these "traveling merchants," and it had not increased or changed the price.

The Travelers' Protective Association proposes that the General Assembly of Ohio shall, by legislation, raise the members of that great body to the rank of a privileged class; shall so endow them that by stepping into an office in Texas, and buying a 5,000 mile ticket or book, for two cents a mile, the holder shall have the right to ride upon any railroad in the Union; and the short road in Ohio, that may chance to haul a member of this great corporation five miles, must go gunning in the Lone Star state to find its ten cents.

* * * The C., L. & W. road traverses a rural region, and is not favored by any large cities on its lines. The capital invested has never paid regular interest, and twice since the commencement of its construction in 1871 has, by default, passed through receiverships, and been forced to judicial sale. In the last re-organization in 1883, the securities were scaled down to a basis far below cash cost and below what the property could be built for to-day, and preferred stock was issued instead of bonds, for the purpose of preventing periodical defaults and judicial sales in the future.

I am aware that it is no concern of this committee, that money has been invested in an enterprise in Ohio that has proved unprofitable. The public, however, has enjoyed the benefits of easy and cheap transit, and the state has regularly received large annual taxes, upon the property, while those that invested their money 15 to 17 years ago, and have been on, are still waiting without returns. The passenger traffic has never paid for the cost incident thereto, and it cannot be charged that the appliances for conducting the business are extravagant, or finer than the traveling public have been educated to expect.

The passenger traffic is purely local, and would not be increased materially, even if a rate of only one cent a mile be established, because the masses are of the working class, and are fully employed earning a modest living by daily work and cannot afford to lose the time to travel, except at long intervals.

The proposed legislation, both as regards passenger fares and freight tariffs, appears to me to be especially aimed at the poorer class of railroads, wholly within this state, and it is, therefore, proper that this committee be informed thoroughly and well, upon one point, and if you doubt the statement, you can easily seek information that will confirm what I say. It is this: there is no railroad wholly within this state, *traversing an agricultural region*, and not connecting large cities, that can be maintained and pay a return of 6 per cent., nor 5 per cent, nor 4 per cent. per annum on its cash cost, from revenue derived from *local* business, both passenger and freight.

* * * I beg to suggest, that you keep steadily in view the close relations existing between the manufacturing, commercial, agricultural and railroad industries of Ohio; they are mutually dependent upon each other, and should a railroad, more than anything else, be legislated into the poor house?

Now I beg to inquire if we are to be allowed to reduce our expenses by doing away with the last passenger trains, and ask our patrons out of courtesy to the Association of Commercial Travelers and in deference to the majesty of the law to content themselves on freight or mixed trains, as the best we can afford at the lawful price. If the poor state roads are to be rendered almost worthless, will there be any relief from the burden of taxation, and if deprived of revenue by legislation, should they not be protected from liability if thereby and in an equal degree they are forced into decay, for it takes revenue to build bridges and repair roadbed, structures and equipment.

The general public in Ohio are not clamoring for this legislation and the daily press of Iowa informs us that two cents a mile is asked for in that state and that there is no popular demand for this reduction, and that only the commercial travelers are demanding it, the most of whom live outside the state.

The railroad system in Ohio bears a relation to the state and the public, fairly corresponding to the system of circulation in the body of man, which when full and healthy gives the glow of mental and bodily strength and force; but when weakened or suspended, leaves man limp and prostrate. The proposition, then, as I view it, is that an injury and loss will be inflicted upon the arteries of traffic in Ohio, if these bills are placed upon our statute books, that can only be measured by millions of dollars, and that infliction will be without one palliating or redeeming consideration, and without benefit to the state and with great damage to her citizens.

Welded Steel Pipe.

The results attained in the manufacture of butt-welded steel pipe at the Riverside Iron Works, Wheeling, W. Va., were described in a recent issue,* but the following additional figures will be interesting.

This process introduces a new use for steel, and has therefore created considerable attention. The table below gives the results of tests as to the relative strength of steel and iron pipe, both made by the Riverside Iron Works. The tests were made Feb. 13, 1888.

	Original dimensions.	Area.	Limit of elasticity per sq. in.	Ultimate strength per sq. in.	Elongation in 8 in.	Per cent. of elongation	Per cent. of reduction	Where broken.	How welded.	Appearance of fracture.	Remarks.
Steel	.998 × .263	.2635	37,720	62,480	1.50	18.75	48.58	Not at weld.	Mechanical lap weld.	Silky fracture.	Cut from a piece of Riverside lap weld steel pipe with the weld in the middle.
	.999 × .255	.2548	40,820	66,330	1.38	17.25	51.41	Not at weld.	Mechanical lap weld	Silky fracture.	Cut from a piece of Riverside lap weld steel pipe with the weld in the middle.
	.998 × .230	.2295	36,800	51.860	0.56	7 00	16.34	Broke at weld.	Hand lap weld.	Silky fracture.	Cut from a sheet of Riverside steel, and welded in the middle
	.997 × .220	.2193	40,130	56,090	1.04	13.00	54.73	Not at weld.	Hand lap weld.	Silky fracture.	Cut from a sheet of Riverside steel, and welded in the middle.
Iron	1.0 × .205	.2050	33,660	44,630	0.40	5.00	10 09	Broke at weld.	Hand lap weld.	Fibrous fracture.	Iron plate cut with the grain and welded in the middle.
	1.0 × .200	.2000	34,000	43,500	0.34	4.25	10.30	Broke at weld.	Hand lap weld.	Fibrous fracture.	Iron plate cut with the grain and welded in the middle.
	.998 × .250	.2495	30,650	42,480	0.18	2 25	6.93	Not at weld.	Mechanical lap weld.	Fibrous fracture.	Cut from a piece of standard lap-weld iron pipe with the weld in the middle.
	.996 × .245	.2440	30.330	35,240	0.04	0.50	5.08	Not at weld.	Mechanical lap weld.	Fibrous fracture.	Cut from a piece of standard lap-weld iron pipe with the weld in the middle.

Tests made with pieces of tube immersed in a mixture of one part of strong nitric acid to 90 parts of water, showed that the corrosive action had far less effect on the steel than on the iron, the loss of weight with steel being about one-third of that of the iron test pieces.

It is stated that several thousand tons of steel pipe have now been made in sizes up to 8 in. diameter, and that it possesses many advantages over iron pipe, not only being stronger and more free from seams and flaws, but making tighter joints, owing to the greater hardness and more perfect forms of the threads, which are moreover stronger, owing to the greater strength of the material.

* See *Railroad Gazette*, page 103, Feb. 17, 1888.

The Train Telegraph.

A number of the members of the Association of North America Railroad Superintendents and others, on Thursday, April 12, made a trip over the New Jersey Division of the Lehigh Valley at the invitation of General Superintendent Goodwin, for the purpose of inspecting the Induction Train Telegraph System.

A new and handsome car, just from the Lehigh Valley shops, was attached to the 1 P. M. train from Jersey City for the use of the guests, who were entertained by Messrs. R. H. Wilbur and Jas. Donnelly of the Lehigh Valley road. A number of messages were sent and received and telegraphic communication was continuous during the entire time that the car was on the New Jersey division, including the time that it stood on the siding at Easton, waiting for the return train. Several of the superintendents who are old operators showed by their manipulation of the key that they have not "lost their grip." On the run back to New York, some surprise was manifested that there was not more of a falling off in the strength of the tone in the receivers, some claiming that they appeared to be fully as loud as they were on the west-bound track, though the train was twice as far from the wire at this time. A slight mishap to the engine near Bound Brook served to give the railroad men present a practical illustration of the value of the system, information of the delay (which, however was brief) and a request for another engine being sent to the dispatcher direct from the train, and the engine being found ready at Perth Junction. Among those present were Messrs. C. S. Gadsden, Charleston & Savannah; J. B. Morford, Michigan Central; C. A. Darlton, Richmond & Danville; E. T. D. Myers, Richmond, F. & P.; L. T. Myers, Seaboard & Roanoke; C. A. Gilchrist, Fort Madison & Northwestern, and Messrs. Goodman and Scott, of the Union Switch & Signal Company.

The Cairo Bridge.

The great bridge across the Ohio at Cairo, which is building for the Chicago, St. Louis & New Orleans Railroad Co., is progressing steadily. The contract requires its completion in 1889. There are to be two spans of 518 ft. each, seven spans of 403 ft. each, and three spans of 250 ft. each, the total structure being 4,607 ft. long. It will be a single track truss bridge, with parallel chords, and built of steel. The bottom of the superstructure will be 53 ft. above high water and 103.17 ft. above low water. The foundation is carried to at least 75 ft. below low water. The piers are entirely of masonry, of Bedford stone, the up-stream starlings of granite. The cribs and caissons are 30 ft. × 70 ft., 50 ft. high, and are sunk by pneumatic process. One of the smaller piers is finished; two of the large channel piers are practically completed, and the crib and caisson of the third channel pier are completed and partly sunk. Two other piers are now under construction. By the close of 1888 all of the foundations are to be in, two of the 518 ft. spans and two of the 250 ft. spans are to be raised, and probably one 403 ft. span. The contractors for the whole structure are the Union Bridge Co. Anderson & Barr are putting in the piers, and Baird Bros. are to erect the superstructure. The approaches will be by wooden trestle, which it is intended to fill in eventually. The bridge proper is to cost about $2,500,000, and the Illinois Central Railroad Co. guarantees the contract.

The Transcaucasian Railroad.

The Transcaucasian Railroad runs from Poti and Batoum on the Black Sea to Baku on the Caspian. The distance from Batoum to Baku is 558 miles, and the total line, including branches, is 621 miles. Of this 40 miles is mountain line over the Suram pass. Batoum being the chief exporting port on the Black Sea for trancaucasian products, the branch extending to it was made, as soon as opened, part of the trunk, with Batoum as western terminus in preference to Poti.

The line from Poti to Tiflis was completed in 1872, and the portion from Tiflis to Baku in 1882. The mountain portion has heavy grades and sharp curves, there being curves of 564 ft. radius on 2.2 per cent. grades. The heaviest grades are 4.6 per cent., with curves with a radius of 564 ft.; grades of 2½ per cent., with curves of 915 ft. radius, while the roughest portion, the actual mountain portion, has grades

of 4.2 to 4.6 per cent., with smallest curves of 1,058 ft. radius.

The motive power on the mountain portion is twelve-wheeled Fairlie engines, weighing 69 tons in working order, while in the flat country and valleys six and eight-wheel engines, weighing from 32 to 42 tons, are used.

The increase in the traffic and other considerations have rendered a reconstruction of the mountain line necessary.

The growth of traffic is shown in the following table:

	1882		1883.		1884.	
Freight carried.	To Batoum.	To Baku.	To Batoum.	To Baku.	To Batoum.	To Baku
Petroleum, tons.	.....	.....	44,731	3	65,000	.....
Other, tons	33,855	110,543	36,428	83,259	82,000	82,000

A commission appointed by the Russian Government estimated that an increased traffic can be developed, reaching a total of 529,687 tons, of which 380,000 will be toward Batoum.

In 1884 the company submitted to the government a project for the improvement of the mountain line, to give one per cent. gradients in the direction of heaviest traffic and 2.5 per cent. in the other direction. The estimated cost of this improvement is about six million dollars, and the estimates have been approved by a government commission. The project includes a tunnel 13,720 ft. long and five small tunnels aggregating over 2,300 ft. The long tunnel will be double tracked; its estimated cost is a little over two-thirds of that of the whole improvement, and it will require from four to five years' time before ready for traffic. This correction of the mountain line will provide for the increase in traffic, which, especially for naphtha products, is sure to take place, and any sudden demands on the line for military purposes which in a vast empire like Russia are liable to be made.

TECHNICAL.

Car Notes.

The Carlisle Manufacturing Co. will soon commence building 200 cars for the Burton Stock Car Co., and 100 cars for the Iron Car Co., of New York. The cars are to be equipped with the Stimpson diamond truck and the Stimpson improved brake.

The Bloomsburg Car Works are working on an order of 333 cars for the New York, Lake Erie & Western. This company has recently added a wheel foundry to its works, and wheels made in it are to be used on the Erie cars.

The New York & New England road is building 10 first-class standard passenger coaches, 3 combination, 2 baggage and a number of coal cars at its shops at South Boston.

The Scarritt Furniture Co., of St. Louis, Mo., is building Forney car seats for four cars, and also Scarritt chairs for four others, for the St. Louis & San Francisco. Two cars of the Wabash are being fitted with 48 Scarritt chairs each, and the company is also doing some work for the Pullman Car Co., and has recently placed its chairs in the cars of the Lake Erie & Western and the Louisville, Evansville & St. Louis. An addition to the factory is now being built.

The Ohio Falls Car Co., Jeffersonville, Ind., has just shipped three cars to the Western of Alabama.

The Ensign Manufacturing Co., Huntington, W. Va., has just delivered 50 coal and coke cars to the De Bardeleber Coal & Iron Co., of Birmingham, Ala.

The Cleveland, Columbus, Cincinnati & Indianapolis has just completed 50 double-deck stock cars at the Cleveland, O., shops. They are fitted with air brakes and the Janney coupler.

Bridge Notes.

Proposals are wanted at Annapolis, Md., no date specified, for the construction of a bridge at Laurel, Md. Address the County Commissioners at Annapolis.

R. M. Douglass has been awarded contract for a bridge across Bossett's Creek, at Minneapolis, Minn. The contract price is $2,281.

A bridge is to be erected over the Tennessee River at Guntersville, Ala., by the Tennessee & Coosa Railroad.

It is reported that a bridge is to be built at the canal at Cumberland Mountain, Nashville, Tenn., by the Nashville, Chattanooga & St Louis road.

The County Commissioners will build a bridge over the Willamette River, at Oregon City, Ore., to cost $24,000.

The County Commissioners will erect a bridge at Danbury, N. C.

The following proposals for the construction of an iron bridge superstructure over the Miami River, at Poast Town, O., were received by the Butler County Commissioners:

Pittsburgh Bridge Co., Pittsburgh, Pa., $24,000; Smith Bridge Co., Toledo, O., six plans from $15,400 to $18,000; Wrought Iron Bridge Co., Canton, O., three plans, $51, $52.90 and $52 per lineal foot; Groton Bridge Co., Groton, N. Y., $20,800 and $22,090; P. E. Lane, Chicago, Ill., $14,827; Variety Iron Works Co., Cleveland, O., $19,900; Indiana Bridge Co., Muncie, Ind., $17,999; Penn Bridge Co., Beaver Falls, Pa., $18,515; Massillon Bridge Co., Massillon, O., $20,000 and $18,500; Berlin Iron Bridge Co., Binghamton, N. Y., $21,500 and $29,000; Milwaukee Bridge & Iron Works, Milwaukee, Wis., $14,899; Mt. Vernon Bridge Works, Mount Vernon, O., $18,900, $19,245 and $19,265; Columbia Bridge Co., Dayton, O., $45 50 per lineal foot; King Bridge Co., Cleveland, O., $14,675, $16,404, $16,575, $16,925, $16,573; for iron joists, $1,350 additional; Missouri Valley Bridge Works, Leavenworth, Kan., $15,775.

The Commissioners awarded the contract to the Smith Bridge Co. for $16,500.

It is expected that the contract for the bridge across the Susquehanna River, at Bloomsburg, Pa., which will afford the Bloomsburg & Sullivan a connection with the Pennsylvania system, will be let May 1.

The Keystone Bridge Co., of Pittsburgh, Pa., is erecting for the New York & Long Branch two new double track plate girder draw-bridges, one over Cheesequake Creek at Morgan, N. J., and the other over Oceanport Creek between Little Silver and Branchport. Each bridge is about 120 ft. long.

Bids are asked until May 1 for erecting an iron bridge at Pittsfield, Mass. Address Henry J. Jones, Chairman of the Selectmen.

Bids are asked until April 26 for the erection of the superstructure of an iron foot bridge in Forest Park, St. Louis. Address Henry Flad, President of the Board of Public Improvements.

Manufacturing and Business.

The Wainwright Manufacturing Co., of Boston, report the following sales of their corrugated tube feed-water heaters during March: Two to Boston and one each to Springfield, Spencer, East Braintree and Huntington, Mass.; one to Putnam, Conn.; five to New York City; one each to Paterson and Hackettstown, N. J.; one to East Liverpool, Ohio; one to Lake City, Fla., and one to Montreal, P. Q.

The Laidlaw & Dunn Co., of Cincinnati, O., has been awarded the contract to supply two 7 by 28 ft. Galloway boilers (300 h. p. each) and the pumps to supply the same for the Electric Lighting Department in Washington Park, at the coming Cincinnati Centennial Exposition.

Edward P. Allis & Co., of Milwaukee, Wis., have been awarded the contract for supplying the city of Chicago with five new triple expansion condensing pumping engines with a capacity of 15,000,000 gallons of water a day each—a total of 75,000,000 gallons. The total cost will be about $400,000.

The Daft Electric Light Co., of New York, is considering the question of the advisability of moving its factory from Greenville, N. J., to New York.

The Pennsylvania Diamond Drill Co. is erecting a large works at Birdsboro for use in the manufacture of their diamond rock drilling machines. The main building is 122 × 77 ft., three stories high.

The Gilliland Electric Co., of Adrian, Mich., has lately closed the contract for the wood work for the Edison phonograph and the mimeograph. The contract is a large one, and its rapid execution requires the most improved machinery. The wood working tools will be procured from the Egan Co., of Cincinnati.

The Toledo Dock & Coal Co. has been organized with a capital stock of $100,000 to increase dock facilities at Toledo, O. The concern will operate primarily in the interest of the coal, ore and lumber business of the Wheeling & Lake Erie Railroad.

The Hartford Steam Boiler Inspection & Insurance Co has elected the following officers: J. M. Allen, President; Gen. William B. Franklin, First Vice-President; Francis B. Allen, Second Vice-President, and J. B. Pierce, Secretary and Treasurer.

The Moore Manufacturing Co., of Chicago, Ill., has removed its office to 51 Franklin street. The company has recently been made agent for the Scranton Mfg. Co., of Chicago.

The Laidlaw & Dunn Co., of Cincinnati, have just sold a large duplex pump, to go to Yokohama, Japan. Within a few weeks they have made a large shipment of machinery to Sidney, Australia. They have contracted with the Commissioners of the Centennial Exposition of the Ohio Valley and Central states to furnish them with the pipe, fittings and valves to be used in fitting the engines, boilers, etc. They have also contracted to supply the material for the steam and water heating in the new Chamber of Commerce Building of Cincinnati.

Wanamaker & Brown, the large clothiers of Philadelphia, have received an order from the Union Pacific for $100,000 worth of uniforms for the conductors and brakemen on that road, and six men are now going over the line taking the measures of the trainmen.

Iron and Steel.

The new rolling mill of the Straight Fibre Iron Co., at Fortieth street and Stewart avenue, Chicago, alongside the tracks of the Pittsburgh, Fort Wayne & Chicago, is nearly completed. The works comprise two fireproof buildings, one of which, 150 ft. square, contains the trains of rolls and their appurtenances, and the other, 50 × 100 ft., will be used for an axle department. The specialty of the works will be railroad car iron. A large part of the works will be devoted to making "straight fibre" axle bars. The daily capacity of the works will be 200 axles and about 50 tons of bar iron, and it is expected they will be in operation by May 1. The following are the officers of the company: George H. Holt, president; F. B. Felt, Vice-President and Manager; James McM. Smith Secretary. Their city office will be at La Salle and Adams streets.

It is stated that a rolling-mill company is being organized at Trinidad, Col., to manufacture merchant iron, and will erect a mill to cost about $80,000, and to be completed in four or five months. The Lewis Manufacturing Co., of Pittsburgh, Pa., has the contract for furnishing the machinery.

The Mahoning Valley Iron Co., of Youngstown, O., will soon commence the erection of a blast furnace to cost about $150,000. It will take the place of their present furnace, which will be dismantled.

The Russia mill of the Falcon Iron & Nail Co., at Niles, Ohio, has been closed temporarily.

The suspension is announced of Messrs. Tyler Brothers, manufacturers of steel tubes, of Boston and New York, who had mills at South Boston, Mass., for tube manufacturing. They were the owners of half the stock in the Christiana Rolling Mill, at Wilmington, Del.

The Spaulding Iron Works, at Brilliant, Ohio, resumed work last week, after a suspension of several weeks.

It is announced that Matthew Addy & Co., Cincinnati, Ohio, have secured the agency for the sale of the product of the Thomas furnace of the Birmingham Mining & Manufacturing Co., near Birmingham, Ala. One stack is completed, with a capacity of a little over 100 tons daily, and another stack will soon be built.

The Cedar Point furnace of the Port Henry Furnace Co., Port Henry, N. Y., has blown out preparatory to making repairs. This stack has been in blast for over a year.

Work will be resumed at the Delaware Rolling Mills, Phillipsburg, N. J., this week.

The Missouri Malleable Iron Co., St. Louis, Mo., is turning out 15 tons of iron daily, one-half of which is used in the malleable department.

The two rolling mills at Hollidaysburg, Pa., and the Rolling mill of the Portage Iron Co. at Duncansville have closed. The works employed about 600 men.

The Chicago office of the North Chicago Rolling Mill Co. has been changed from No. 17 Metropolitan Block to No. 761 Rookery.

The new furnace of the Ashland Iron & Steel Co. at Ashland, Wis., was blown in lately and is doing well.

The Rail Market.

Steel Rails.—Sales of about 7,000 tons have been made by Eastern mills at private terms for delivery in the South, from which section several inquiries have been made, with little actual business. Quotations: $31@$31.50 for standard sections at eastern mills.

Old Rails.—The market continues irregular and dull. Sales of about 5,000 tons have been made, among them 1,500 tons of double heads on barge at $21, and the sale of a small lot still pending. Small lots are offered at $20.50 for tees and $21 for double heads, with few sales. Larger lots are held for higher prices.

Track Fastenings.—Quotations: Spikes, 2.10@2.20c., delivered; angle bars, 1.8@1.9c.; bolts and nuts, 2.7@3c.

Brake Notes.

It is stated that the Chicago & Alton is fitting its entire passenger equipment with the improved quick-acting Westinghouse triple valve.

The Prescott Automatic Brake Co., of Chicago, Ill., has been incorporated with a capital stock of $2,000,000 by C. I. Wickersham, A. B. King and W. O. Cook.

Train Lighting in Germany.

At a recent meeting of the Frankfort branch of the Society of German Engineers, Herr Voigt gave some interesting figures regarding the cost of train lighting on various German railways. On the Würtemburg lines electric lighting has now been in use for some time, and the cost per hour for a 12½ c. p. lamp, based on the use of the light for 2,100 hours per annum, varies from 0·62 cent to 0·88 cent, the average being considerably below the cost of lighting by oil gas. The cost of oil gas is least on the State railway in Saxony, the lamp hour costing there 0·752 cent, and most on the Halberstadt and Blankenburg line, where the cost per lamp hour amounts to 1·38 cents. The cost of gas plant, including compressing machinery and piping, amounts to $12,500 for an output sufficient to supply 150 carriages with gas. The advantages of electric train lighting are summarized as follows: (1) Complete independence of the charging station, so that the electrically lighted trains may be run over any lines. With oil gas the whole service is disorganized if through an accident at the gas works or through fire the supply of gas is interrupted; (2) the light is better than gas, and there is no danger of explosion and fire in case of collision; (3) the expenses for labor are lower, because no preparations are required before the light is actually wanted; (4) the working expenses are lower, as found by experience: (5) the cost of plant is only slightly greater than that for gas lighting; (6) the weight of lighting plant to be carried on the train is less than with gas. It is interesting to note that an engineering works in Esslingen have already fitted several trains not only in Germany, but also abroad, with electric lighting plant. Amongst these are six trains on the Novara-Seregno line in Italy, and some on the Russian South-western Railway. On the Italian lines the plant works almost automatically, an attendant only accompanying the train over a few stations to oil and look after the machinery, and then returns by the next train in the opposite direction, so that during most of the time the machinery is left to itself. Notwithstanding this want of supervision no hitch has as yet occurred in the lighting.

The Nicaragua Canal.

CAMP CARAZO, Nicaragua, March 23.—The following additional engineers for work in placing the canal line have arrived from New York: J. H Covode, J. Clyde Power, Chiefs of parties; Benjamin F. Bates, First Assistant Engineer; E. D. Very, Henry J. Dodge, Second Assistants, George F. Pohlers, Rodman and Draughtsman; W. H. Pearlbrook, Rodman. Mr. Power is made chief of party No 6 for the survey of the San Juan River from Fort San Carlos to Machuca Rapids. These parties have already left for their respective stations, party No. 6, together with No. 5, J. E. Perez, chief, No. 3, and No. 3, J. G. Holcomb in charge, having started for Lake Nicaragua on the 19th inst. Parties Nos. 3 and 5 will begin at once a survey of the western division from the mouth of the Rio Lajas to Brito, the Pacific terminus of the canal. The work assigned parties Nos. 3 and 5 in their sections of the eastern division is accomplished.

The work in the western division of the canal does not contemplate any radical change in the route from the Lajas to Brito, but is principally for the purpose of obtaining a minute knowledge of the route, and to put such data in the hands of the company that contracts for the work may be let at once. In this division there will be four locks, one of the features of the route being the division of the Rio Grande and the Rio Lajas. As at present estimated this division will cost $17,000,000. Mr. Peary is now engaged in looking after the work in the eastern division, but he will probably leave for the interior on the next steamer about the 1st of April. The hydrographic party, Mr. W. J. Maxwell, chief, left Greytown for Fort San Carlos two weeks ago, and has since been engaged in making a survey of the entrance to the lake by San Juan. In a few days it will be transferred to the mouth of the Lajas, where it will make further surveys. The health of the expedition continues good.

New Switch.

Henry Leley, a colored employé of the Louisville & Nashville at Birmingham, Ala., has recently invented an automatic double switch. It is a device which is intended to be used for double switches in railroad yards. It is very simple, and uses two frogs and two pieces of splits less than the double switch now in use. It is so arranged that by throwing only one lever, one or both switches act, according to the circumstances.

The Ensley Furnaces of the Tennessee Coal & Iron R. R. Co.

The great iron works which the Tennessee Coal, Iron & Railroad Co. is building at Ensley City, Ala., are now nearly completed. There are four furnaces with a daily capacity of over 800 tons, which will employ about 700 men when running full. The furnaces are said to embody the latest improvements of modern practice. The furnaces have 12 blowing engines, built at the Weimer Machine Works Co., of Lebanon, Pa., with a capacity of 250 h. p. each, and there are 2,100 h. p. engines for hoisting the ore to the top of the different furnaces. There are 64 steel boilers 34 ft. long and 48 in. diameter. This furnace plant has been built under the superintendence of Major H. C. Hargreve, and is said to have cost upwards of a million dollars. Ore is brought from Red Mountain, 6 miles away, where mines are owned by the company. The company also owns the Pratt coal mines, which partly underlie the furnaces, and one of the slopes is only 500 ft. away. These mines have an output of 3,000 tons daily. The company makes its own coke within a mile of the furnaces, and has in operation over 1,000 coke ovens. The Red Mountain ore is said to be equal to any in this country or Europe. It assays, metallic substance 70, silica 20, foreign matter 10 per cent. Ensley City, which is 7 miles from Birmingham and 8 from Bessemer, has now a population of about 2,000, and our correspondent says that all are busy in "every pursuit but drunkenness, robbery and rapine." The company has built numerous short lines of railroad and has a considerable plant of rolling stock. Mr. Edward Bates Dorsey, Mem. Am. Soc. C. E., who has been engaged for the last three months in an examination of the Louisville & Nashville for English and German stockholders, says that many new furnaces will go into blast within the next six months in the iron region of Northern Alabama, which will give an increase of over 2,000 tons in the daily output of pig-iron in that region. He estimates that a well-located, large furnace, scientifically managed, can produce pig iron at $8 per ton.

New Transfer Boat.

The new transfer boat S. B. Barlow, used in transferring trains across the Mississippi at St. Louis, is 245 ft. long, 47 ft. beam, and 8 ft. depth of hold, with a double railroad track in the centre, which can accommodate fourteen 34 ft. freight cars. She has four steel boilers, each 44 in. dia. and 28 in. long. Her cylinders are 24 in. dia., with 7-ft. stroke; wheels of 30 ft. dia., with 12 ft. bucket. She has two doctors, "nigger," engine and boiler, forward and aft capstans, electric lights and all the latest improvements.

RAILROAD GAZETTE

Published Every Friday,

At 73 Broadway, New York.

EDITORIAL ANNOUNCEMENTS.

Contributions.—*Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and in their management, particulars as to the business of railroads, and suggestions as to its improvement. Discussions of subjects pertaining to* ALL DEPARTMENTS *of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections appointments, and especially annual reports, some notice of all of which will be published.*

Advertisements.—*We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay,* EXCEPT IN THE ADVERTISING COLUMNS. *We give in our editorial columns* OUR OWN *opinions, and those only, and in our news columns present only such matter as we consider interesting and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.*

The report of the proceedings of the last meeting of the New England Railroad Club, which is published in this issue, contains no intimation of the unfortunate personalities which detracted from the interest and profit of the discussion. The resolution, which was adopted, limiting the discussion to certain definite lines, was vigorously, and, as many thought, rather harshly, enforced, and considerable feeling was aroused. With so many interests represented and so many speakers, it was necessary to define the lines of talk pretty strictly. It is questionable, however, if it would not have been more satisfactory to most of those present had direct discussion been allowed of the topic of Prof. Lanza's paper. The continuous heating men naturally felt that that paper, to some extent, misrepresented them, and that they should have been allowed to make their answer on the spot. But they were not allowed to investigate closely Professor Lanza's methods, or to make him demonstrate the correctness of his conclusions. Many of them had come from considerable distances to discuss the general subject of steam heating. They listened to an account of some experiments which went to show that continuous heating is not so economical as many think. They saw, or suspected, errors in the experiments or the deductions; but discussion of the subject was promptly shut off. Naturally they felt that there had been a mistake made in the conduct of affairs.

It may be doubted if any of the steam heating men were prepared to discuss Professor Lanza's paper profitably and conclusively, even if all the evening had been given up to them, because none of them seem to have even attempted to do what Prof. Lanza tried to do, that is, to measure accurately the quantity of steam used in heating their trains. They have been satisfied to repeat that the power so diverted is not appreciable, and some have even said that the engines hauling steam heated trains have this winter burned less coal than in past winters, when the same trains were warmed by heaters in the cars. Of course every one knows that when that has been the case, other conditions must have come in to lessen the amount of coal burned. Some additional coal must be burned to heat a train even if it is heated by steam from the boiler. We are prepared to believe that it takes less fuel to warm a train when that fuel is burned on the locomotive than when it is burned in half a dozen stoves, but that it takes *no* fuel to warm a train by steam from the boiler we are not prepared to believe, and it is not for the interest of the promoters of the continuous heating systems to try to make any one believe it. Prof. Lanza's experiments were in the right direction, and the only way to controvert him is to make more extended and more accurate researches of the same sort. The winter has demonstrated that trains of ordinary length can be comfortably, uniformly and safely heated from the locomotive; but it yet remains to be proved that the continuous system is cheaper than the independent, when fuel, attendance, maintenance and interest accounts are considered. This probably can be proved, and everybody wishes, in the interest of humanity, to have it proved, but the owners of the various continuous systems have a more powerful interest, and it is for them to get together and bring forward the data, without which discussion must be pointless and inconclusive.

No less than 12 serious accidents directly caused by snow are reported in our accident record for March, and 10 of these accidents occurred in the neighborhood of New York, during or after the unprecedented snow-storm of March 12. With one exception each of these accidents resulted in loss of life or serious injury to employés, and in all 12 persons were killed and 14 injured. It is of course possible that our record is incomplete, especially as regards the number of accidents and the number of persons injured. It is, however, manifest that one severe snow-storm in one part of the country is enough to produce serious loss of life which would be largely avoided by a safe and efficient means of clearing a line of snow. The inconvenience, delay and pecuniary loss caused by a snow blockade are only too self-evident, but the loss of life and the damage to engines, snow plows and rolling stock are also very serious items which cannot be overlooked.

The ticket agents of the Pennsylvania road have been instructed not to accept folders, time-tables and other printed matter from foreign roads, or rather to send to headquarters all such stuff that is forced upon them, and connections have been requested to forward their publications direct to the general passenger agent. The aim seems to be to cut the affectionate ties subsisting between the ticket seller and the benevolently inclined traveling agent of foreign roads, who, in the trying circumstances entailed by the non-commission-paying agreement, has an interesting habit of distributing along with his "soft-matter" sundry papers of a much finer texture than that on which his time-tables are printed. Whatever the object of this order, however, or its effect, there is no question that the distribution of time-tables and information for passengers ought for its own sake to be radically reorganized. Tons of paper, on which great expense of printing has been wasted, goes where it does no good, while passengers are constantly going without or are spending much time to obtain the very information which these publications are designed to give. The passenger department of the Pennsylvania or of any road can do its connections a real service by systematizing this sub-department: and on most roads there is room for improving, in the same line, the handling of the home time-tables. Changes should be announced uniformly a certain number of days in advance. The notices should always be sent to the same places, and no posters or large quantity of pocket-tables permitted to be placed except at registered locations. All publications of a road should be revised at one office before issuing. The local newspaper advertisements of some roads manifest all sorts of inconsistencies, even to giving positive mis-information. Local agents should keep foreign folders, etc., accurately classified ready for easy reference, and be instructed to promptly throw aside all matter which is out of date. A ticket agent cannot feel confidence in the information he gets from foreign roads' time-tables unless he is assured that the office issuing those tables will regularly and promptly notify him of changes.

THE M. C. B. TYPE OF COUPLER.

The publication of the contour lines of the M. C. B. Type of Automatic Freight Coupler, as settled by the Executive Committee of the Master Car-Builders' Association, marks, it is to be hoped, the commencement of a new and better era in one essential operation in railroad working. The old and barbarous method of coupling cars is finally, after a struggle lasting over thirty years, to be superseded by a safe, mechanical and common-sense type of coupler, by which cars can be coupled without a loose link or pin, without any danger to the men, and without slack. These are a few of the negative advantages, but the positive advantages are equally important. The adoption of an automatic coupler enables the cars to be coupled by simply setting one knuckle in the coupling position. The adoption of the vertical plane principle allows cars of different heights to be coupled readily, and further prevents a portion of the weight of a low or heavily laden car being borne by the link, draw-head and draw timbers of an adjoining light or high car. The saving of time in coupling and uncoupling is also an important advantage, the time wasted over misfitting or crooked links being often considerable. The vertical plane type also enables loose slack to be practically entirely abolished, and it is now generally acknowledged that this is a distinct improvement. Not only are the shocks, jerks and breakages of couplings in long trains much diminished, but a heavier train can be started with tight than with loose couplings.

The railroads of this country owe a debt of gratitude to those members of the Master Car-Builders' Association who have been untiring in their efforts to bring about this great reform. Their efforts especially deserve the thanks of the rank and file of the railroad army, the men actually engaged in the work of coupling and switching cars. In a few years the dangers of these operations will be a thing of the past, and the improvement—the greater ease and safety in coupling cars—will be greatly due to those mechanical officers and engineers who were the first to accurately gauge the merits of the enormous variety of car couplers brought forward. For many years this mass of inventions, generally crude and ill directed, simply retarded progress. Each car coupler was judged on its merits and met the almost invariable fate of being condemned on its demerits. No classification was attempted and few endeavored to formulate any statement of the principles on which a car coupler should be constructed, or the conditions which it should fulfill. Car couplers were tried in a perfunctory and unsystematic manner, and even the Master Car-Builders' Association could only recommend for further trial couplers which a few months' practical working showed were utterly unfitted for general adoption.

The first real step towards a satisfactory solution of this difficult problem was made by Messrs. Wall and Cloud, at the Saratoga Convention of the Master Car-Builders' Association in 1884. The principle that couplers must be classified, and that an examination into the relative merits of the various types must precede any adoption of one particular coupler was there for the first time clearly enunciated, and Mr. Wall in an able speech showed very conclusively that the Association should decide on a certain number of principles which a coupler should fulfill. The first step was then taken in defining these principles, and the debate showed conclusively that in point of mechanical fitness the vertical plane type was superior to all others. A motion to that effect was unanimously adopted by those present at the Convention.

Subsequent events have shown that this resolution, though little understood at the time, was fully justified. The various practical trials and tests made at Buffalo and on various roads in actual service established the superiority of the vertical plane type, and some definite step as to the adoption of a general type throughout the railroads of the United States and Canada was evidently only a question of time. The Executive Committee of the Master Car-Builders' Association finally proposed at Minneapolis that vertical plane couplers of the Janney type be adopted as a standard, and that in order to insure uniformity and prevent monopoly, "all forms of couplers that will couple to and with a standard Janney coupler in the possession of the Association, should be considered as within the Janney type, and conforming to the standard of the Association."* A resolution to that effect was adopted by letter ballot, and an automatic vertical plane freight coupler was added to the list of standards adopted by the Association. The lines now published are the outcome of this resolution, and henceforth any coupler made to these lines and coupling with a standard Janney draw-head of this form will be accepted as an M. C. B. coupler.

It is to be hoped that railroads throughout the country will at once equip all new cars, and, as far as possible, renew all old couplers with the M. C. B. coupler. The dangers of delay in this question have been often urged in these columns, and must be widely appreciated and need not be again repeated.

The committee not only publish the contour lines, but recommend a standard length of draw-bar and dead block. The opinions expressed in these columns as to the necessity for 9 in. dead blocks are fully confirmed by the Executive Committee of the Master Car-Builders' Association, as their engraving shows 9 in. dead blocks, and their report states: "The committee are of opinion that double dead blocks or bumpers should invariably be used with this type of coupler."

The dimensions of the dead blocks recommended will prevent the couplers being driven completely

*See *Railroad Gazette* June 17, 1887, page 400.

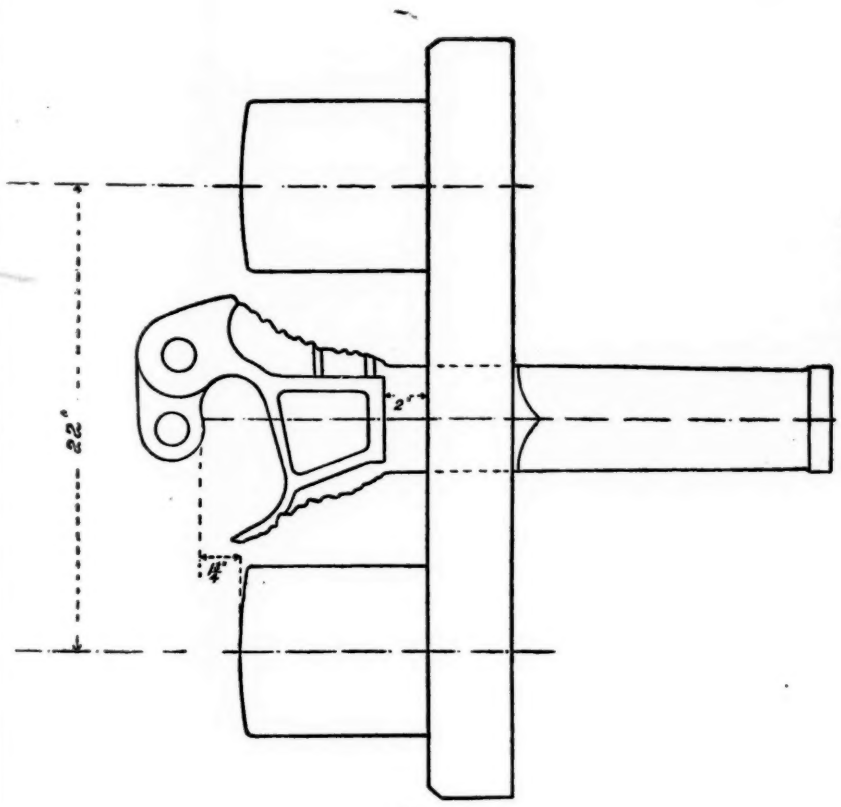


Fig. 2.

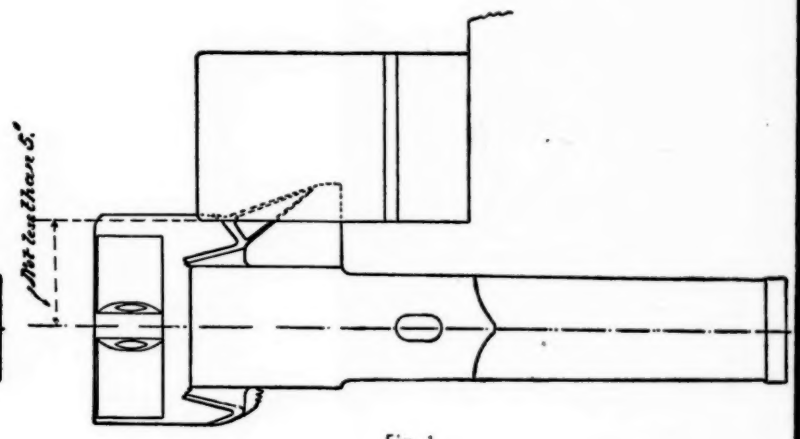
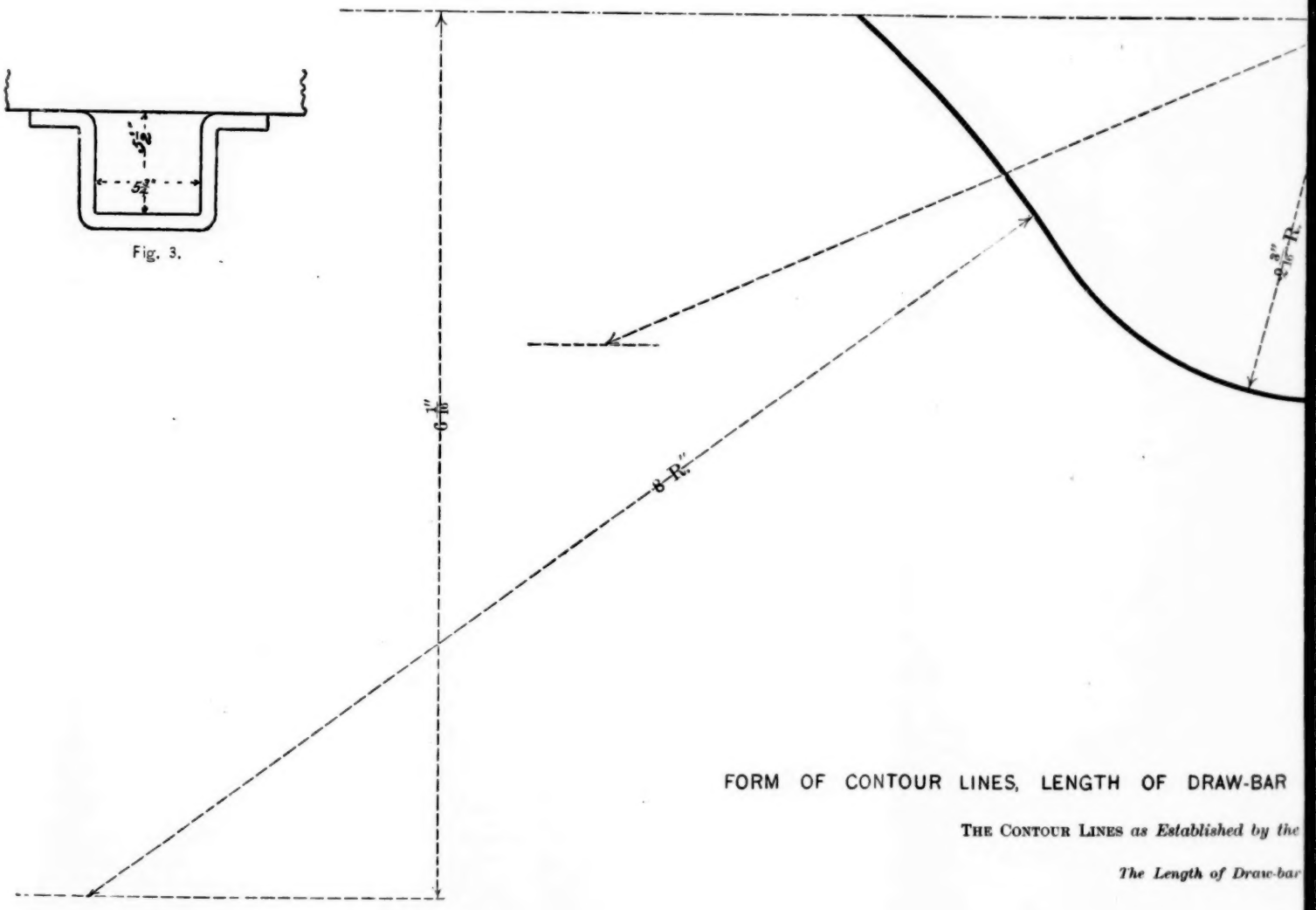


Fig. 1.

Fig. 3.



FORM OF CONTOUR LINES, LENGTH OF DRAW-BAR

THE CONTOUR LINES *as Established by the*

The Length of Draw-bar

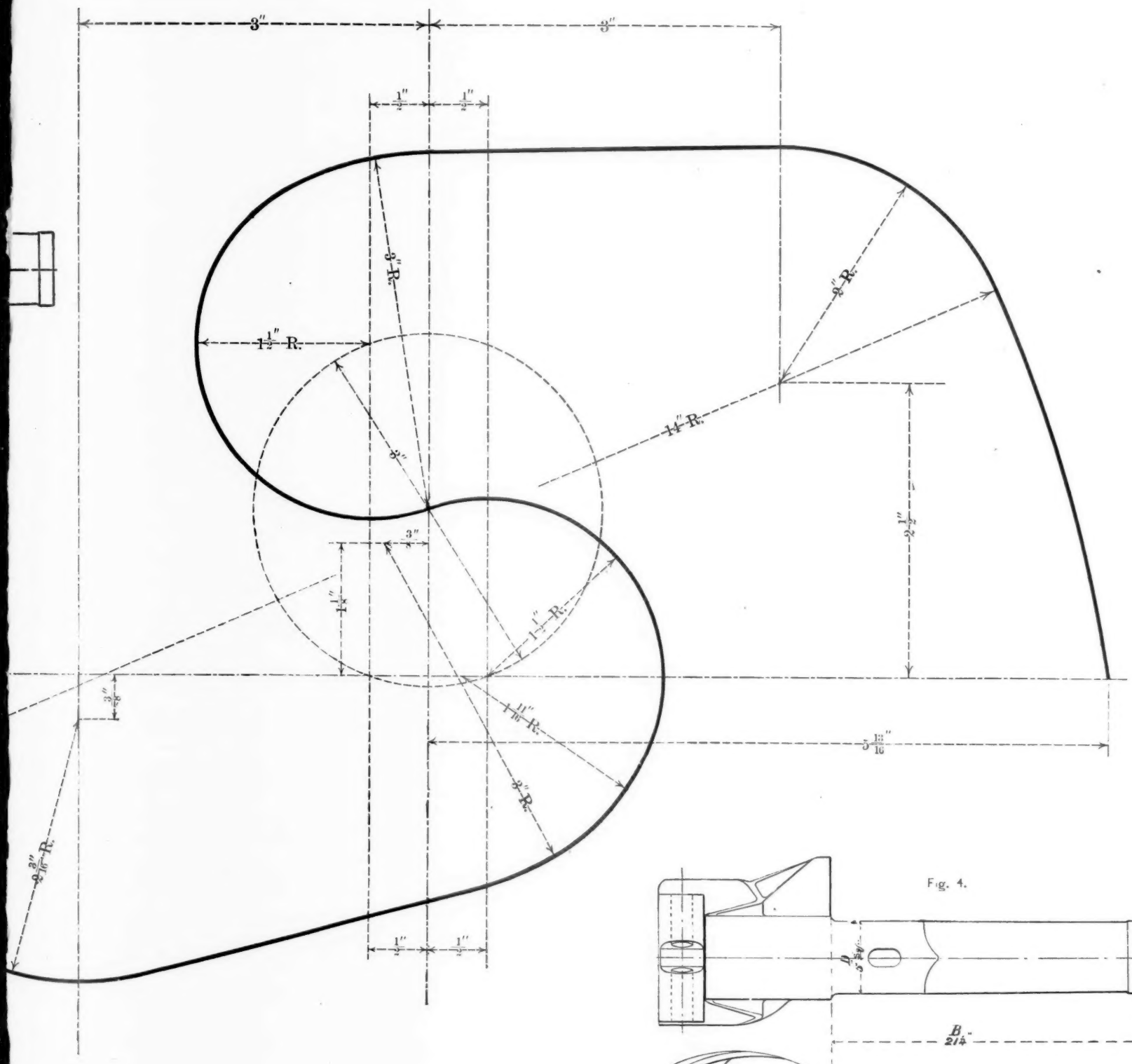


Fig. 4.

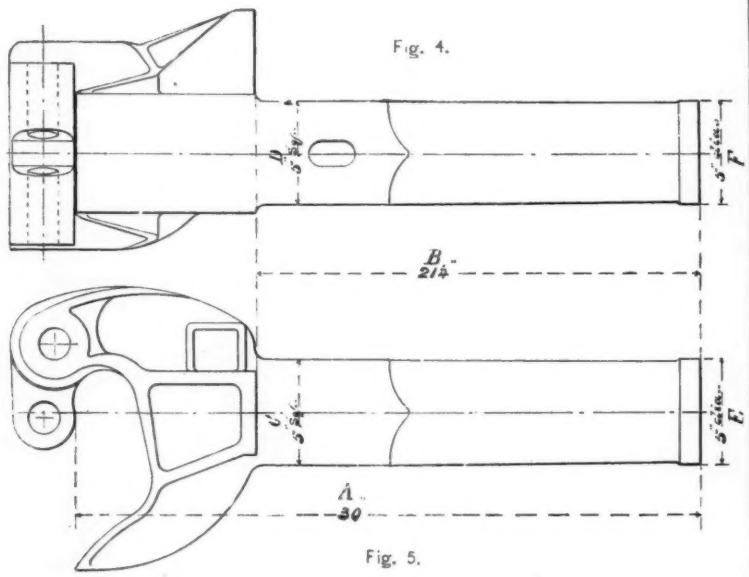


Fig. 5.

-BAR AND ARRANGEMENT OF DEAD BLOCKS FOR M. C. B. AUTOMATIC CAR COUPLERS.

by the EXECUTIVE COMMITTEE OF THE MASTER CAR-BUILDERS' ASSOCIATION, *April* 8, 1888.

Draw-bar and Arrangement of Dead Blocks are Recommended for Adoption.

home, and will consequently prevent many cases of broken draw springs, and even in that event the presence of the dead blocks will prevent the cars coming together and will keep the cars a proper and safe distance apart.

The lines as shown full size in our engraving appear to be admirably proportioned and have doubtless undergone the most skillful consideration by the subcommittee,—Messrs. Cloud, Forney and Wall,—who were especially appointed to consider the question of the contour lines, which would afford the maximum of strength, with the greatest ease in coupling. These gentlemen may be congratulated on the conclusion of their labors, and Messrs. Wall and Cloud may be especially congratulated on the ultimate triumph of the vertical plane principle, carrying with it the absence of slack. These gentlemen were foremost in advocating these principles, when it was almost universally believed that a heavy train could not be started without link slack. This idea has been often combatted in these pages, and actual experience with both loose and tight coupled trains long since convinced the present writer that slack was an unmitigated evil and a fertile source of broken links and couplers.

The proprietors of the Janney patents are also to be congratulated on their public spirit in waiving their undoubted rights to the lines adopted. The manner in which any railroad represented in the M. C. B. Association can use these lines is clearly explained in the M. C. B. circular on the subject. This waiver appears to be a graceful and generous act on the part of those interested pecuniarily in the Janney coupler. They have enabled railroads to fully adopt the recommendations of the committee, insuring a uniform coupler, while effectually guarding against a monopoly in the supply of couplers to the million freight cars of this continent.

At the close of a victorious campaign some mutual congratulation is natural among those who fought on the winning side, and happily in this case, the war of the rival couplers has had for its object the saving of life and property. A state of peace or glorious inaction means as regards couplers the reign of the death-dealing link and pin. It is now open to all to replace these relics of barbarism with the best devices that the joint labor of some 4,000 inventors and an unknown number of railroad officers and men in the mechanical and other departments have been able to produce. The M. C. B. type is the result of a vigorous process of endless tests, trials and experiments, practical and otherwise, which have at last resulted in a survival of the fittest. The benefits derived from the adoption of the new type will be more clearly perceived as it comes into general use. Some difficulty will, no doubt, be found in coupling with other types, but this difficulty will diminish with every link and pin that is added to the scrap heap and replaced by the M. C. B. type. All should now unite to reap the fruit of the long fight, replacing the present diversity of couplers by one uniform type, the M. C. B. coupler.

Superintendents and Their Men.

Nothing is plainer than that the mere question of the amount of wages is only one of a number of sides to the "labor problem." Whichever side is wrong in the Burlington strike,—the managers or the "labor"—the lesson for that and for all roads is to try to avoid disputes in the future; and too much faith in the mere payment of wages to the neglect of other phases of the relations between employer and employé has undoubtedly been a potent cause of disturbances on railroads heretofore. The most troublesome and dangerous strike at the west was the switchmen's, and their complaint was not about their wages. Assuming that a certain body of men are receiving reasonable pay, how shall they be kept from making unreasonable demands for more, or from taking their employer by the throat? Railroads should not wait for the public to step in and try to compel trainmen to do their duty by "covering" them with shotguns; there is yet ample room for trial of more humane and civilized means.

Believing that there is need of great improvement in the methods of engaging men and of dealing with them afterwards, and that too little thought is generally spent in this direction, we have taken pains to inquire somewhat into the administration of some superintendents who are admittedly successful in maintaining good relations with their men, and purpose to give here some of the results of these inquiries. These officers not only maintain agreeable relations with their men, they also have sound business reasons for their course in the plainly improved efficiency of their forces. A marked example of a successful policy in this line may be found on a certain small interior road whose superintendent has achieved some definite and very satisfactory results. We say "small" road because, although this is by no means one of the smallest, it is one which can be quite effectually supervised by one man, with proper office assistants; delegation of important affairs to division superintendents at distant points is not necessary. Although such delegation of authority is unavoidable on large roads, we do not regard it as a very serious hindrance to the carrying out of the same plans that serve a smaller organization; we allude to it here simply to preclude any misapprehension.

The officer in question has brought the personnel of his road from a very low state to a very high one, and the annual expenditure on "accident account"—bills for damages by poor switching, rear collisions and worse, breakages of drawgear, damage to supplies, etc.—has been changed in the opposite direction, from very high to very low. This fact gives interest to the methods employed in spite of any possible appearance of personal eulogism in their recital.

This man's first and probably most important qualification is a natural adaptation to the work. He has not only "business ability," as it is generally called, decision of character, comprehensive grasp of details, and so on, but he has also the corresponding negative qualities. He does not employ his brother or cousin for private secretary, or promote a certain conductor because he is the brother of some good fellow, or has been unfortunate in his domestic relations; nor does he employ a mediocre grade of talent in a position so as to save the trouble of hunting up a person more fit for the place. Geniuses, like poets, are supposed to be born, not made; but we do not here place natural fitness first on the list of qualifications for the purpose of discouraging those who believe themselves something else than a genius. Most of us strive to emulate some genius, whatever our limitations.

The next important advantage possessed by this officer is an intimate acquaintance with the road. He had been connected with it for years before he assumed the management, and therefore had become well acquainted with the men. By this we do not mean necessarily a personal acquaintance with every one of them, but a good insight into the capacity and disposition of the different grades and classes and a knowledge of the prominent traits of most of the higher train and station men. The importance of this point is recognized by the best students of railroad science. However "great" a system of roads may become, and however great the ability in the management at headquarters, there is as yet no substitute for first-class ability, experience and courage in the officer who deals directly with the station and trainmen. "Ability," as generally understood, may perhaps be imported, and experience can, to a certain extent, be transplanted; but on a railroad they cannot be of full value for a long time, and the third requisite, courage, is found only where it has grown up on the ground. In the management of a hundred or a thousand trainmen nothing will take the place of real acquaintance, which grows but slowly.

This superintendent, though following strictly business principles, is frank and direct in his intercourse with his men. No brief statement here can describe the difference between this habit and its opposite, and yet every one knows that it demands tact and firmness of a high order to be kind and considerate to employés while at the same time requiring a high degree of efficiency from them. There is no trouble in being gentle when the demands of business do not press, and it is also easy to execute work well when there is no trouble in getting efficient help, or when efficiency can be secured simply by cursing or cracking a whip; but to get along without the old gravel-train methods of compulsion is not so easy. To neglect the reprimanding of a man because it seems to be too much trouble, or it seems easier to wait until he commits a graver error is an injury to the service and an injustice to the man. The chief usefulness in a reprimand is not in the opportunity it gives to reproach one for past misdoings, but in its furnishing an occasion to impart forcible instruction for the future. Taking this view of the matter, no fault is too small for a text provided the man recognizes that it is a fault.

The system of promotions on this road is a good one and it is carried out. "Civil-service" is not paraded as a pleasing topic for newspapers to use as a text for their puffs and then disregarded in practice. It is enforced both in the lower grades and the higher. If a conductor is made trainmaster, an engineer promoted to foreman, or an operator appointed dispatcher, he understands from the first that he *must fill* the place. A return to the former grade, however humiliating to the appointee or painful to the feelings of the superintendent, is sure to follow a failure to show the desired efficiency. The difference between this (in a business point of view) and the ordinary way of keeping a man in a place so long as he does "middling well," simply because it is mortifying to acknowledge that a mistake was made in choosing him, needs no explanation.

Engineers are always made from firemen. Firemen must not only show the general qualities which promise to make them good engineers in the future, but they must have been already employed on the road in some other capacity (usually as brakeman). The body of firemen from which runners are to be selected is thus a picked force already, so that the likelihood of getting good enginemen is increased. In the selection of freight brakemen, who, it will be seen, constitute the corps from which both engineers and conductors are most likely to come, the first point considered is, strange as it may seem, a moral one. The first question is not, "Where have you 'braked' heretofore?" but, "What sort of a fellow are you?" One of the points deemed most important is to get men who have long lived on or near the line of the road. Love of home, which will thus affect the individual's allegiance to the road, is certainly a moral force. Hiring tramp brakemen (even if they are respectable tramps) is in one sense encouraging disloyalty, for it is filling up the force with men who have strong influences leading them elsewhere. The only advantage gained is the experience they have acquired on other roads; and often the experience which it is necessary for them to unlearn counteracts that to a considerable extent. The trouble of teaching them the rudiments is avoided, but such teaching is just what yardmasters need to keep their own wits well brightened up, and green men should be given them often enough to provide this.

Suspensions are very sparingly employed. From what has been hinted concerning intimate relations between officers and men, the reader will infer that "breaking the ice" is a process that is not often necessary. Men learn that the commission of an offense is not made the occasion of a flourishing of the headsman's axe, regardless of the degree of guilt or of whether an actual beheading is to take place, and so they talk matters over freely with the superintendent. The latter is equally free, and as his acquaintance with the men naturally leads him to take cognizance of their motives it follow that "a good talking to" generally serves as well as a suspension, if not better. But it is equally true that persistent carelessness or other wrong motive is discerned, and the punishment of dereliction in this regard by a final discharge is inflicted with promptness, when necessary, without waiting for some costly damage to prove the man's inefficiency. The principle of specially rewarding careful and efficient service is also employed with good results.

Not the least effective of the disciplinary means employed is the secret service. This is maintained constantly, and is closely looked after. Probably more time and money are spent on inspection, both open and disguised, than on many a road working twice as many men. And this has been done with so much tact that instead of creating an impression among the men that they are abused it has on the contrary brought about increased freedom of intercourse, and the officers at headquarters have the special confidence of, and receive unsolicited reports from, many of the best men. The men's knowledge of the train rules is carefully inquired into, after the methods lately alluded to in these columns as in force on the Fall Brook Coal, Chicago, Burlington & Northern, Erie and other roads.

But space forbids the completion of the account. It is scarcely necessary to remind readers of the *Railroad Gazette* that the general principles on which these changes and improvements have been effected are substantially the same as those which have often been advocated in its columns. The only fault with these principles is that they are of no value unless applied. The idea that a railroad has more or less capacity to run itself is responsible for many of the ills that railroad officers have occasion to worry over. No one of the things here enumerated is recommended as a substitute for good wages, nor will all of them together justify a wrong in the monetary side of the account; and yet there is no question that good treatment and honest dealing are financially valuable, and that where the facts are known these conditions will keep men from going away and seeking work on roads where different conditions prevail. Given a natural leader who knows his men, who is courageous to work for the interest of the road even if individual interests suffer, and who is sustained in picking his men from a class of society where there is at least *some* moral standing visible, a creditable per-

sonnel, and one much above the present general average, is within reach. A standard of qualification must be established and the men conformed to it. Adapting the standard to the men has always been up-hill work. To effect a transformation like that here referred to on a large road or a system of roads, would require a dozen or a hundred men imbued with the spirit of a leader such as we have described; but would it not pay to find them? Friendliness of the employer toward the employé is shown, and very effectually, too, by a mutual benefit scheme like that of the Pennsylvania; but the criticism of such an institution is that it is wholly outside of and separate from the railroad work itself. It may not foster an *esprit du corps* any more than a chess club or a pic-nic association would. It might exist alongside of unpleasantness or even abuses in the relations between the rank and file and their immediate superiors.

Underbilling.

We give in another column extracts from the opinion of Commissioner Walker on underbilling. The general facts are not especially new to railroad men, but they are presented with convincing circumstantiality. We can do little more than indorse the conclusions of the Inter-state Commerce Commission on the subject. The origin of underbilling is lost in the mists of antiquity. We have no doubt that the cargo of the Mayflower in 1620 contained copies of Shakespeare's works (D 1—owner's risk of a "big, big D") shipped as Bibles (3). And unless Noah was the Barnum as well as the Cunard of his time, and owned a menagerie before he went into the carrying trade, we presume that the bills of lading of the Ark described rhinoceroses as "hogs" and boa constrictors as "undamageable pipe." A slight difference in name makes an enormous difference in expense. We once heard of a man who bought an Egyptian mummy, which he wished to ship home by rail. To the first railroad agent he frankly told the facts in the case, saying that the article was a dead king. "Kings, dead or alive, must pay first-class passenger rates," was the reply of the inexorable agent. Learning wisdom by experience, our friend studied the classification for himself, and finally shipped his mummy (by another line) under the head of "Meats, cured, in boxes."

The advantages of underbilling to the shippers are so great that it has always been a more or less prevalent way of getting rebates; it has a special importance since the passage of the Inter-state Commerce act, because it is now almost the only way. Not that it is any less unlawful than the others. The act not merely prohibits discrimination by special rate, rebate, or drawback, but also by "any other device." This of course covers the case of underbilling. The difficulty lies, not in the law, but in its execution. It is harder to stop underbilling than to do away with other favors of discrimination, because it is harder to fix the responsibility for it.

If a road gives a rebate the results will appear in some shape on the books of the company. It can be proved that certain responsible agents of the company knew what was going on. In case of false billing, no such proof is possible. Even against the agent at the point of shipment there may be nothing more than a strong presumption of guilt. The shippers are the only parties to whom the responsibility can be brought squarely home. They are also the only ones who get much benefit from the transaction. Yet under the existing state of the law they are precisely the ones who go unpunished. The law attempts to enforce a penalty against A for allowing B to deceive him, when the deception is largely to B's advantage and somewhat to A's hurt. It is not really carried out further than to make the railroads a sort of scapegoat for the sins of their customers. The looseness of the present practice, even on the best disposed roads, is illustrated by the statement that the Michigan Central, in weighing suspected cars, feels obliged to ignore all differences of 1,000 lbs. or less. Half a ton of corn is worth $25 more in New York than in Chicago; quite a good-sized rebate. It is a queer travesty on systematic business methods to favor shippers in a way which leaves them liable to such inequalities as between each other. We are glad to see that the Commission and the public are beginning to recognize that this state of things is bad. There is a demand for a change in the law, by which the legal responsibility for underbilling shall be fixed where the moral responsibility is, upon the shipper.

Are not the railroads also responsible for it? Yes and no. Yes, because if all the railroad officials were men of the highest integrity, underbilling could not go on. No, because under the existing state of things it is difficult for the better class of railroad men to stop the practice by individual action; and because the law, if it does not prevent united action, at any rate goes far to discountenance it. If the law allowed pools it could hold the railroads responsible for underbilling, because they could take common action to stop it. The law does not allow pools; it cannot expect from the individual railroads a course of action which will annoy the shippers and will make them send goods by the route which best evades the law. The only wonder is that our roads have already done so much to check the evil. Their efforts in this respect show that it is an evil which the leaders desire to see abolished. They also show, incidentally, that it is impossible to exact from the companies a penalty for a practice which hurts them, and which they are trying to stop as far as the law will allow them to.

The parties responsible for the fraud are: first, the shippers; second, the receiving agents; last and least, the railroad companies. They should be held responsible in that order. The law to-day does just the reverse. The sooner it is changed, the better.

Australian Railroads.

It is not long since Mr. Simon Sterne alluded to Australia as an example of the economy which could be attained under state railroad ownership. The case is worth looking into. The circumstances of Australia are so much like those of our own western country that a comparison of the results of private ownership in the one case with state ownership in the other could not fail to be instructive, if only complete figures were obtainable.

The Australian colonies, including New Zealand, had, at the close of 1887, about 9,000 miles of railroad in operation. Nearly all of this was owned by the colonial governments. It had cost some 86,000,000 pounds sterling, or about $47,000 per mile, as against a capitalization of $62,000 per mile for the American roads. It was probably this difference which Mr. Sterne had in mind. But when we follow the matter into detail we find that any such general comparison is quite unfair. The railroad systems of Australia may be divided into two classes. Those of Victoria, New South Wales, and New Zealand are constructed and operated on something like the American standard. Those of the other provinces are nearly all narrow gauge, and lightly equipped; in a comparison of this kind it is simply misleading to include them.

Now, taking the railroads of the three provinces with standard construction, and comparing them with our own, we have the following results:

	Miles in operation.	Cost.	Cost per mile.
Victoria	1,880	$120,000,000	$64,000
New South Wales	1,889	117,000,000	62,000
New Zealand	1,727	63,000,000	37,000
	5,496	$300,000,000	54,000

In other words, the cost per mile of the roads in Victoria is a trifle greater than the average for the United States, that in New South Wales the same as ours, and that in New Zealand a great deal less. Let us see whether there are any corresponding differences in the character of the roads. The amount of equipment per mile may be taken as a rough indication of the relative standard of efficiency.

EQUIPMENT PER 100 MILES.

	Locomotives.	Pass. cars.	Freight cars.
Victoria	18	43	281
New South Wales	21	50	442
New Zealand	15	29	469
Average	18	41	397
United States	21	20*	676

*Including baggage and mail.

As far as this comparison shows any thing at all, it indicates a difference in equipment about proportionate to the difference in cost. The large excess of passenger cars and deficiency of freight cars in Australia is, of course, quite noticeable.

The statistics of work done are too incomplete for purposes of comparison. Passenger mileage and ton mileage are not given at all; train mileage is not given in the way it ought to be; figures of tons and passengers carried mean very little. The former in Australia are ridiculously small; the latter, in Victoria at least, are so large that we are not ready to accept them without further inquiry. The roads of Victoria report over 49,000,000 passengers carried during the year. This means an average of 49 journeys for every man, woman and child in the community. It means that 200 different passengers per day all through the year were carried on an average by each car. If the railroad managers of Victoria have really succeeded in making people travel so much, and in using their cars so well, they should publish the results to the world, and give more details. In the absence of such details we find it hard to believe that the facts have been properly presented.

We have been obliged to rely mainly on Henry Greffrath's figures, which give no help in explaining this point. If any of our readers can direct us to fuller sources of information or throw additional light on the subject we shall be glad.

The Chicago, Burlington & Quincy Report.

It is surprising that people who have managed property as honestly as the authorities of the Chicago, Burlington & Quincy should not give fuller reports of what they are doing. The Burlington report tells very little, and what little it does tell is not always quite straightforward.

For instance, we find on p 21 of the report for 1887 the statement that "operating expenses show an increase in 1887 over 1886 of $1,606,229.89, due chiefly to unusually heavy expenditures for stell rails and ballast, to the increase in mileage and to the larger volume of tonnage." Now if we analyze this sentence carefully we shall find that it does not mean very much. But it is intended to convey the idea that the item of track repairs was an important element in the increased expense—not merely that they paid more than in previous years, but that this item was one which showed a special increase. Otherwise there is no sense in putting this first. If the sentence does not mean that, it does not mean anything.

What do we find to be the facts in the case?

	1886.	1887.	Change per cent.
Total operating expenses	$13,647,030	$15,253,000	+ 11½
Track repairs	2,817,000	3,113,000	+ 10½
Miles operated	3,743	4,239	+ 13¾
Track repairs per mile	753	730	− 3

So far from being the prime reason for the change, track repairs have not increased so fast as operating expenses in general, nor have they increased in proportion to the mileage operated. If the accounting officers of the company should take exception to this last statement on the ground that it was unfair to count the new track on the same basis as the old, we can only reply that they have themselves set the example of so doing (p. 20, line 8) in a much more unfair instance, where it happened to help them to make a favorable showing.

But, to follow up the matter, what were the "unusually heavy expenditures for steel rails?"

Let us look at what has been done during successive years:

	1885.	1886.	1887.
Miles of track laid with steel east of Missouri River	130¾	177	123¼
Miles of track, with steel substituted for iron, west of Missouri River	98½	129¾	88¾

Instead of finding a reason for unusually heavy expenses we see that each of these items is smaller in 1887 than it was in either of the previous years. We have no means of telling just how these expenditures were divided between maintenance and construction. But for our present purpose that is not necessary. We need only observe that these two items include all the steel rails that could possibly be charged to maintenance; and that it is not likely that the allowances for new construction account were proportionately any less in 1887 than they were in previous years.

It may be thought that we are laying a great deal of stress on a comparatively light matter. We do not regard it as such. When men like the president and directors of the C., B. & Q. allow misleading statements to go out under their name, they countenance a practice which they of all men should be most anxious to stop. What they do without dishonest intent, others will do as a means of fraud. And it becomes them to be doubly careful of late, since they have ceased to give figures of train-mileage and other items of information as to the work they are doing. The less they tell, the more scrupulously careful they ought to be that whatever they do tell is true in spirit as well as in letter. We cannot think that they have done their duty in this respect in the report before us.

The fact simply is that the Burlington, for various reasons, did a larger business than it had done before, and at lower rates. Of course this involved additional expenses. Station service increased $300,000, or nearly 20 per cent.; car repairs in the same ratio; while the other leading items of expenditure, track repairs among the number, increased 10 per cent. or thereabouts. It was to extraordinary traffic that the change was due, not to extraordinary repairs. It is best to admit the fact and accept the consequences.

A correspondent of the *Railroad Gazette*, who has just made extensive journeys over the Chicago, Burlington & Quincy lines, writes that all passenger trains have been resumed and are running with the usual regularity. At the time of the strike there were 1,053 engineers employed, and April 14 there were 1,011 new men on the pay rolls, every one of whom is believed to be a competent engineer. He writes that one official of the Union Pacific has said that the Reading men who have gone to the Burlington are unusually good men—better than the run of western engineers.

"I talked with many of the train men, station agents, and with officials of other roads—especially the Union Pacific—and found an almost unanimous verdict in favor of the company. In the first place all agreed that the action of the engineers was entirely too hasty: that they did not display their usual conversatism in dealing with the road before declaring a strike, and that they had not shown the same spirit of fairness during the strike as characterized their utterances when it was first inaugurated. At the beginning, Chief Arthur declared that if the Burlington could operate its lines independent of the brotherhood, that body would consider itself defeated, and would accept the situation without grumbling. The petition purporting to be signed by 'leading business men' at Aurora appears not to have been the work of representative business firms there, but made up almost entirely of small dealers who had done a large business with the strikers previous to the present difficulty. A Mr. Courtright, Vice-President of the Courtright Metal Roofing Company, who has lived at Aurora for ten years, was unable to recognize on the list shown him by me a single concern which he would call a *leading* business house. The trains which I traveled on from Kansas City to Omaha and Omaha to Chicago were on time, and so far as the ordinary traveler could discern everything was running as smoothly as though no strike had

ever occurred. An occasional Pinkerton man might be seen at the various stations and possibly a squad of them at important points; but beyond this there was nothing to indicate any trouble. The most pointed statement made concerning this whole matter was one by Paul Morton, which, I believe, is worth quoting. He said: 'The Burlington road has bought the right to manage its own business. It has a new asset good enough to warrant the issue of bonds to cover the cost of its purchase, be that one million dollars or whatever the strike may be found to have cost when it is figured up. Every road must meet this issue sooner or later, and the Burlington congratulates itself that it has passed the critical period and has nothing more to fear in the way of strikes for some time to come.'"

Acts of lawlessness continue to be reported occasionally from Chicago, and the problem of running a railroad in the "tough" lumber-district is not yet wholly solved. Last week, Thursday, a dispute arose at a grade crossing between a Chicago, Milwaukee & St. Paul and a Burlington switch train. Stones and pins were freely thrown, and one Burlington man, who was struck in the face by a lump of coal, drew his revolver and fired at the engine of the other train. A race on parallel tracks ensued and one of the engines, to gain time, was cut loose from its train, which then ran back down a grade past some danger signals at a grade crossing, but no harm was done. A switch tender of the Wisconsin Central was fatally assaulted in his switch-house. The Burlington has offered a reward of $300 for the capture of any person who meddles with switches or cars. On Friday the police had a severe tussle with rowdies in the St. Paul road's yards at Western avenue, but they finally arrested three switchmen. The striking engineers have published lists of engines alleged to have been damaged by carelessness on the Burlington road, giving particulars, but the statement appears to have an unsubstantial basis, and the road's claim that repairs required on engines are not unusually heavy at present, seems to refute the charges made.

President Perkins has issued a circular, thanking the employés for their zealous exertions in "the late strike," and enjoining them to make the new men feel at home.

The people of Portland, Oregon, seem to be making up their minds to acquiesce in the arrangement between the Union Pacific, Northern Pacific, Oregon Short Line and Oregon Railway & Navigation Co., by which those lines may go on and build up their systems and develop traffic unvexed by bankrupting wars. These people do not take any broader view of the situation than before, but they think that they see in the agreement the elements for its speedy rupture. They are no more convinced than ever that the best interests of their country will be served by a sound and orderly growth of its railroads, but they do not think that the railroads can long keep from cutting each other's throats. The agreement provides that in all the territory north of the Columbia, the Snake and the Clearwater, excepting a belt within 15 miles of the Columbia & Palouse Railroad, the Northern Pacific alone shall build branches and extensions. South of the Salmon and east of the Snake, and south of a line from Huntington west to the summit of the Cascades, the territory is to be occupied by the Short Line or the Union Pacific. East of the Snake, between the Salmon and the Clearwater, and west of the Snake in the territory bounded on the north by the Columbia and on the south by the line from Huntington to the Cascades, the O. R. & N. is to have exclusive right. This division of territory is intended to prevent the waste of parallel building, and the companies concerned are fortunate in having the opportunity to apply the lessons of other men's mistakes. It is to be hoped that the predictions of the opponents of the plan will not be fulfilled, and the agreement be broken at the first serious conflict of interests.

The Portland people fear present diversion of trade to Tacoma, and further, that when the agreement is dissolved the territory north of the Columbia and Snake will be so covered by the Northern Pacific that the O. R. & N. will be unable to occupy any part of it with profit. The agreement provides that tariffs to Portland and Tacoma shall be equalized, and that business originating within certain limits shall be taken to Portland unless specially consigned to Tacoma. Moreover, the O. R & N. undertakes to maintain a cheap and efficient towing and lighter service on the river "so that charges on shipping here shall be no greater than at Puget Sound."

Still, Portland is not willing to take its chances in fair competition with Tacoma, or with regulated competition among the railroads; but it is the opinion of the committee sent to confer with the officers of the roads, "that if Portland shall make the most of her situation and opportunities, this compact among the railroads will be found to give her little real ground for concern. Even if it shall go into effect, which may be doubted, it will fall of its own weight as soon as it begins to hurt any interest affected by it." In this last reflection they evidently find comfort.

In the first three weeks of April there have been widespread floods and much injury to railroad property and business, but the injury has not been so great as the very heavy snowfall would have led one to expect. In Vermont, a train was wrecked near Rockingham by the sliding of a very old side hill fill. In Massachusetts, several bridges on the Housatonic were more or less seriously damaged, and highway bridges in other parts of the state have been carried away. Landslides and washouts of track are reported from various points in the Middle states and the South, and more or less damages to small bridges. It is on the lines of some of the Northwestern roads, however, that the effects of the spring floods have been most felt. The serious accident on the Chicago, Milwaukee & St. Paul near New Hampton has already been noted. A bridge on the same road near Sioux City is said to have been carried away, and several on the River Division in Minnesota. It is said that over 2,000 ft. of track was washed out near Elk Point. One despatch, in fact, states that six miles of road was so damaged at that place. The Illinois Central also lost a bridge near Sioux City. Five "bridges" on the Minneapolis & St. Louis are said to have been carried away, or rendered impassible. At Rock Falls, Iowa, an iron bridge 155 ft. long was wrecked by the flood, but whether a railroad or highway bridge is not stated. At Des Moines, Iowa, the bridge of the Chicago, St. Paul & Kansas City is reported to have been shifted but not wrecked. The Chicago & Northwestern also has lost some small bridges in Wisconsin. In Minnesota and Dakota numerous small highway bridges have been wrecked. It is difficult to sift out of the newspaper accounts many facts as to the injury to railroads, but it is evident that road-bed has been damaged and traffic much interfered with throughout a great part of the upper Mississippi Valley.

Export rates are the subject just now of considerable discussion, though what there is to complain of except a general lack of business is not clear. The Commission has ordered that rates to Europe must be published and the proportion accruing to the railroads stated in the tariff. This seems to interfere with some cherished privilege of the roads, and they are complaining of the law's exactions; what this privilege is does not appear, but probably they want to give the vessels more than a fair share of the price, and have an understanding that a portion of it shall be refunded to the shipper, thus enabling each road to "take care of its friends." While the Pennsylvania, which can carry to both Philadelphia and Baltimore at two and three cents respectively less than New York rates, is complaining that it does not get its share of the traffic—though vessels are understood to carry from the two southern ports at the same rates as from New York—other lines are complaining that they cannot export via Boston, because the differentials favor Philadelphia and Baltimore! Chicago dispatches of Monday stated that provisions and grain were going east of the Lackawanna and Erie lines at 1 to 3 cents less than tariff rates.

Emigrant rates from New York to Western points have been seriously demoralized during the past week. It appears that the Baltimore & Ohio, Delaware, Lackawanna & Western and the New York, Ontario & Western felt grieved at their small share of the traffic and put on outside runners to get passengers who did not secure tickets at the joint agency in Castle Garden. A good many were picked up at boarding houses in the city and agents sent aboard the steamships before they landed secured large numbers. The first reports said that second class tickets were given at emigrant rates and later accounts reported that a rebate of $5 was being paid, making the net price, New York to Chicago, $8. All the lines except the New York Central and Pennsylvania seem to have finally taken a hand, and each made a special bargain with one or more steamship lines as it could get a chance. It would appear that most of the cutting was in the form of commissions to steamship companies and to boarding-house keepers. Passengers' baggage was in many cases taken without weighing, they thus securing a substantial discount by being relieved of excess baggage charges.

The basis of the settlement with the Canadian Pacific for the cancellation of its monopoly privileges has been officially announced at a Ministerial caucus at Ottawa. The government is to guarantee $15,000,000 three per cent. or 3½ per cent. bonds, and the 13,000,000 acres of land remaining unsold are to be taken over by a trust, the proceeds of sales to go to the redemption of the guaranteed bonds. The purposes to which the Canadian Pacific will apply the proceeds of the bonds are given in various press dispatches, but it is not likely that any outsider knows the intentions of the company in this particular. It does seem probable, however, that a good deal of the money so raised will be used for additional equipment. We have before pointed out that much of the complaint last fall from the northwestern country, of inadequate service, was due to the insufficient equipment of the road, and for the last three months it has been commonly said that a large amount of new rolling stock would be built for the road this year. One Montreal correspondent says that as soon as the arrangement with the government is completed the building of 4,000 freight cars and 200 locomotives will be begun.

The report of the committee of the Association of American Railroad Superintendents, which was appointed to consider the proper style and dimensions of frogs, will be found in another column. The committee recommend a spring rail frog for main track. It will be remembered that at the last meeting of the Roadmasters' Association of America the Committee on a Standard Frog reported in favor of a rigid frog, although two years before the Association had recommended a spring rail frog. This report was amended to recommend a spring rail frog for main line use, and in that form adopted. The two associations, therefore, may be considered in substantial agreement on this point and also on the guard rail distance. The Superintendents' Committee recommends 1¾ and 2 in. as the least and greatest allowable distance, while the Roadmasters recommend a flangeway not to exceed 2 in.

In our last issue appeared a communication from "American Genius" calling attention to the Servis tie plate, and in a note we said that the plate will be objected to as noisy, and on the ground that the rail will move on it more readily than on the face of the wooden tie. A letter was at once addressed to Mr. E. K. Turner, Chief Engineer of the Fitchburg road, calling his attention to these objections. The Fitchburg has used the plate for some years, and Mr. Turner in answer to the letter above mentioned says, "We have not experienced either of the evils which are mentioned in the article quoted, and you are at liberty to so state to anyone." In the pamphlet published by the Servis Company, more detailed and specific commendation of the device, from Mr. Turner, and from others who have used it, is given. We make this statement now in justice to the owners of the patent, and have taken steps to get further information from those who are using the plate.

St. Louis dispatches of April 13 stated that the engine men of the St. Louis & San Francisco road had demanded important modifications in their wages. Later, it was reported that conferences with the managers had resulted in an amicable settlement of all differences. The details of the settlement are not clearly stated, though it appears that the keeping of new runners on less than regular pay is to be discontinued. The demand for increased pay for firemen was compromised.

NEW PUBLICATIONS.

A TREATISE ON PLANE SURVEYING. By Daniel Carhart, C. E., Prof. Civ. Eng. in the Western University of Penn. 500 pp. Ginn & Co., Boston.

This work is adapted to serve as a text-book on land and town surveying, in academies and classical schools, where the attention given to this subject is limited. The book is well printed and bound, and the typography is excellent. It follows in the well-beaten track of the older text-books on surveying, being markedly similar to Gillespie's.

But four pages are given to stadia methods, and these are taken up by Specht's developments of the fundamental formulæ, which are very laborious and unsatisfactory. Ten pages are given to the plane table, 14 pages to mine surveying, without any cuts or illustrative examples; 53 pages to a chapter on city surveying, which, however, includes 30 pages devoted exclusively to field instruments, mostly with reference to leveling. The remaining portions of the work are devoted to land surveying by the aid of the needle and solar compass, and the transit.

The chapter on laying out and dividing up land is very complete. In the chapter on city surveying it is recommended to continue the use of the old standard, be it ever so erroneous, rather than adopt a correct one. This is contrary to reason, and also to the court decisions on this subject.

In the list of reference books given on surveying for the student's guidance, no mention is made of Johnson's recent work, although it has evidently been liberally consulted in the preparation of this volume.

The book is evidently put out by a school-book house as a business enterprise and not to satisfy a demand for such a work.

American Street Railways; their Construction, Equipment and Maintenance. By Augustine W. Wright, C. E., Member American Society Civil Engineers, Member Western Society of Engineers. Two hundred pages, numerous illustrations. Flexible morocco. Price, $5. Rand, McNally & Co., publishers, Chicago. For sale by the *Railroad Gazette*.

The author in his preface says that his apology for issuing this book is that during the past twenty-five years no one has written on this subject in the United States. After twelve years experience on steam roads Mr Wright served nearly eight years as Chief Engineer and Superintendent of Track and Construction of the North Chicago Street City Railway, and therefore properly feels that he is well qualified for the work which he has undertaken, which is to make a technical compendium of the materials and methods of construction, maintenance and operation of American street railroads. The various chapters are headed: Track Construction; Paving; Track Cleaning; Equipment; Buildings for Street Railways; and Management of Street Railways, with an Appendix in which the author has endeavored to ascertain and state the amount of horse power used in propelling street cars. Much of this material has already been published in the technical journals; but as gathered in this volume, with very full illustrations, it makes a comprehensive and convenient hand-book of a subject of which the literature is very inadequate and inaccessible. Mr. Wright estimates that on Jan. 1, 1887, there were 4,864 miles of street railroads in the United States with 20,392 cars, employing nearly 99,000 horses, besides cables and various motors. Considering the magnitude of this interest and the difficulty of finding information of the prevailing American methods and devices, Mr. Wright's book will no doubt find a ready sale.

Statistical Abstract. A collection of statistics relating to the iron and steel industries of the United States. To which is added much valuable statistical information relating to the iron and steel industries of Great Britain, the production and prices of anthracite coal in the United States, immigration into the United States, etc., etc. By James M. Swank, General Manager of the American Iron and Steel Association. First edition, price one dollar. Philadelphia. 1888. Pamphlet; 24 pages.

The information contained in this statistical abstract, and there is a great deal of information in it, would be much more valuable if nearly all the American quantities were not given in net tons of 2,000 pounds, while the prices are invariably given for gross tons of 2,240 pounds. Since 1733, when Andrew Hamilton came over from Philadelphia and cleared Zenger from the charge of libel, Philadelphia lawyers have had a proverbial reputation for professional skill and

knowledge, and it is possible that a Philadelphia statistician can explain why a table giving the production and prices of iron rails in the United States from 1849 to 1886, with the quantities in net tons, and the prices per gross ton, should be considered valuable statistical information; but to the ordinary man who wishes to compare the production of this country with the production of other countries, or wishes to arrive at the gross value of production for one or a series of years, Mr. Swank's net tons are an exasperation and weariness.

Nearly all the tables show a gratifying increase in production, not only for the United States but for the world. The prices for the last 12 or 15 years, however, have not been so satisfactory for the producers. From about the commencement of this century prices in England fell until about 1850. From that period until 1873 they rose, and since that they have fallen. Mr. Swank, in connection with a table of British prices for 1830 to 1886, gives in a summary the lowest and highest prices in the period covered by the table. They are as below:

	Lowest price in 1843.	Highest price in 1872.
Staffordshire bars	100 s.	320 s.
Muck bars	77 s. 6 d.	290 s.
		Highest price in 1873.
Scotch pig	52 s.	145 s.
	Lowest price in 1886.	
Iron rails	72 s.	240 s.
		Highest price in 1864 and 1873.
Steel rails	72 s.	350 s.

In this country No. 1 anthracite pig iron was at its lowest average price for the year, $17.62, in 1878, and at its highest, $59.25, in 1864. This was a currency price. In gold it would have been $22.93, and on the gold basis the highest average price, $36.87, was in 1854. The average price of best refined bar iron in store at Philadelphia was $91.33, that year reaching $146.46 in currency in 1864, declining to a minimum of $40.32 in 1885. Iron rails in 1854 were at their maximum gold price, $90.13, going to $126.00 in currency in 1864 and reaching their minimum, $33.75, in 1878. Steel rails are not quoted here before 1867, when they were $166.00 currency, or $119.02 in gold. In 1873 they were $120.50 in currency or $114.15 in gold, and they were at their minimum, $28.50, in 1885. The average price for 1887 was $37.13.

The Western Mineral Wool Co., of Cleveland, O., and St. Louis, Mo., have issued a little pamphlet showing some of the many applications of mineral wool as a non-conductor of heat and sound, with some instructions as to its use and information concerning its properties. Price lists and directions for estimating quantities required for various purposes are also given. A few tests are appended, and letters from several establishments which use the material in large quantities. The company will be glad to send the pamphlet free to any address.

The *Pennsylvania Railroad Voluntary Relief Department* has issued a pocket pamphlet after the style of insurance companies' advertisements, giving information about the nature, objects and advantages of the organization. It is arranged in the form of questions and answers, and clearly explains the points which a new employé would naturally inquire about.

TECHNICAL.

Clark's Deep Tunnel Scheme of Rapid Transit.

Among the numerous schemes of rapid transit recently proposed for New York, the deep tunnel scheme of Heman Clark, of the firm of O'Brien & Clark, contractors for the construction of a large section of the Croton Aqueduct, has created a good deal of interest, as it appears to be bold and comprehensive and likely to afford good facilities without any interference with existing streets or buildings. Mr. Clark proposes to start his tunnel at the surface, near Fleetwood Trotting Park, to cross under Harlem River near Madison avenue, 150 ft. below the surface of the river, to follow the line of Fifth avenue just a little to the west, down under Central Park, to Washington square. Here it starts off in a line parallel with Broadway to City Hall Park, where it branches off into two lines, one of which will cross under the Hudson River near the line of Liberty street and emerge on the surface on the Jersey flats, back of Bergan Hill, where most of the railroads from the west might converge; the other will continue down town to the Battery and cross under the East River to Brooklyn, emerging to the surface in Flatbush, between Greenwood Cemetery and Prospect Park, and continuing thence upon the surface to Coney Island.

A cross section of the proposed tunnel road at a station shows a double tunnel 18 ft. high, two tracks in each tunnel. An elevator with two decks, capable of carrying 300 people, hangs in a shaft between the two tracks. Persons desirous of taking a rapid through train will pass from the elevator through a nine-foot passageway under the tracks, and up a short flight of stairs to the platform on the opposite side of the tracks from the elevator. On one side of the elevator are the down tracks, on the other the up tracks, one through and one local. The elevators empty directly upon the platforms of the local trains. At various points along the line of the road freight pockets will branch off from the main line. They may be made to suit the demands of merchants and shippers. The idea is to establish unbroken connections between the railroad lines entering the city from the North and East and those converging at Jersey City, and both of these with Long Island.

Mr. Clark is very sanguine of the success of his scheme, and is reported as having spoken as follows to a reporter of the *New York Times*: "The elevators will easily handle as large a traffic as the elevated railroad stations can, and will land the passengers easily and safely on the platforms, where the cars can be taken in less time than you can climb the stairs at an elevated railroad station. The ventilation of the tunnel will be accomplished by a mechanical arrangement of towers. Fresh air will flow in a constant stream down through the shafts at the passenger stations along the line of the road and escape through the freight pockets into tall chimneys, the suction of which will maintain a constant current. There will furthermore be no contiguous sewers and gas pipes to filter their noxious odors into the tunnel.

"A low level will avoid steep grades and get a perfectly unbroken solid sub-stratum of rock in which to work. Furthermore, at that depth the concussions and jars from explosions in mining will be hardly perceptible at the surface, and therefore unobjectionable.

"Stations will be established at frequented intervals all along the line. In the business parts of the city we shall buy two lots wherever a station is to be established, and build upon it a structure suitable in general to the character of the neighborhood. In these buildings we will establish our stations on the street floors, from which the elevator can be easily entered. In Central Park, or very near to it if the Park Commissioners should not give us space within the line of the park close to Fifth avenue, we will build an ornate station of a character and appearance harmonious with the surroundings."

Mr. Clark pointed out the convenience and economy of through freight and passenger trains to and from the very heart of the city, and said: "We shall, first of all build a tunnel under the East River from about the City Hall in this city to the City Hall in Brooklyn. This can be done at comparatively small expense, and will effectually demonstrate the convenience and feasibility of the plan to the public, and, what is next in importance, the fact that such a road would be profitable."

Car Replacer.

Thomas Holiday, of Sanborn, D. T., has invented a car replacer or portable switch. The principle of the device is much the same as that of the Palmerton wrecking frog. The car can be replaced from either side of the track, the wheels being guided to the rails by deflecting plates.

New Construction.

The total track laid in the United States for the first quarter of 1888 is given by the *Railway Age* as 1,096 miles by 54 lines in 28 states. For the first quarter of 1887 it was, by the same record 1,040 miles by 49 lines in 25 states. About one-half of the new track this year has been laid in the Southern states. Georgia leads with 113 miles, and in Texas 112 miles have been laid.

The Providence Terminals.

Last September the Mayor was authorized to request three experts to visit the city and report a plan for enlargement of railroad terminal facilities. Joseph M. Wilson, Don J. Whittemore, and Alfred P. Boller were selected, and have recently reported to the City Council, through the Mayor, their plans for a rearrangement. Commissioner Wilson informally explained the plan to the City Council, and it apparently met with much favor. The plan is based upon a separation of the freight and passenger interests; a rectification of the main through tracks so as to allow of train movements with the least loss of time practicable; the location of a passenger station in a convenient position for access from all parts of the city; ample provision for city freight business for all railroads, not only for present purposes, but for future increase; the removal of all grade crossing by streets and the filling in of the cove basin, preferably for a public park, as shown, but available for business purposes if so considered best for the interests of the city.

The proposed plan contemplates a passenger station to be used jointly by the several railroads to be erected near the old state prison at the foot of Smith's Hill, about a quarter of a mile northwest of the present station, and to have passing through it seven continuous tracks, two of these tracks to be on the north, outside of the train shed, for through freights, two under the train shed for through passenger business and three for local trains; the whole being north of and separated from the freight yards of the several companies, which will remain substantially where they are at present.

The freight tracks to the several yards have no direct connection with the main through passenger tracks and connect wholly with the through tracks devoted to the freight service. The freight yards of the various roads are entirely separated from each other and have independent tracks leading to the main freight line. The report embraces a comprehensive plan for enlargement of freight stations and access to them by new streets, and allows ample room for future increase of business. A belt freight railroad, a part of which is already constructed, is recommended, together with the abolition of the tracks through Dorrance street and across Market Square and a general development of the harbor freight business. The Old Colony, which has just assumed operating control of the Boston & Providence, is understood to entertain very liberal views with regard to expenditures for the securing of proper facilities, and in the probable event of the adoption of the plan, it is not anticipated that any of the railroads will oppose it.

A Long Engine Run.

A 10 h. p. Westinghouse engine has been running in the works of the Pittsburgh Gas Light Co. for 13 months without the throttle valve being shut, and it is still running. The engine has run continuously at about 500 revolutions per minute, and has made 288,000,000 revolutions in that time. The last public notice of a long run made by a Westinghouse engine was an instance where a certain engine ran eleven months without stopping at a speed of 300 revolutions.

THE SCRAP HEAP.

A Landmark in Railroad History.

The United States National Museum has requested the Chief Engineer of the Pennsylvania Railroad to erect a fitting monument at each end of the oldest piece of track in the entire Pennsylvania Railroad system, and the oldest in the United States, it is said, with the exception of a short piece on the Baltimore & Ohio road.

The piece of track referred to was laid just east of Bordentown, as a sample for exhibition to the New Jersey Legislature, in September, 1831, and is two-thirds of a mile long. The old turnpike crossing of the railroad was by a wooden overhead bridge, as at present, to show the authorities that there should be no crossings at grade. The road was then laid on stone blocks set in the ground to a depth of 3 ft. After examining this track and the first train run over it, the Legislature granted the privilege to the old Camden & Amboy Railroad to cross the state.

It is proposed to erect at each end of the section a pyramidal granite shaft, with a suitable inscription on two of the sides, the other sides to have fac similes of the first train of cars, or omnibuses, and the engine, John Bull, in bas relief.

Another Unfortunate.

Of all the thousands of people who are possessed with an idea that they have invented the best car coupling the world ever saw, few, alas and alack a day, are humorous in their claims. The circular of a Buffalo inventor is, however, a very creditable effort to enliven the dull variety of car-coupler literature. It might, however, be improved by a few appropriate quotations in Russian, with some Telegu proverbs on the subject. He starts out by saying: "After a long, hard, difficult and laborious work I have succeeded in inventing a new and best-constructed car coupling for railroad cars, which is of the most importance for the American railroading. The system of my car coupling is not only practical by its quickness and safeness in coupling cars, it is also constructed that it is impossible for every one, being occupied with coupling or coupling apart railroad cars, to get hurt or become struck with an accident of any kind."

The reader here heaves a sigh, and the poet proceeds:

"This my car coupling is constructed this way, that, intending to couple two cars apart the lever being placed underneath or above of the car coupling has to be removed from the right to the left hand, and instantly the two cars will couple apart, without making it necessary to pass between them or handle something. Any one, being placed on one side of the cars, so that they can pass the person easy, is able to couple them apart flighty. My patent car coupling is composed so practical, as it has been mentioned before, that the cars can also be coupled apart from above, as, for instance, from a passenger car platform or from the top of a covered freight car. To be short, the cars can be coupled just as well from above as from underneath. Another important progress of my new system of car coupling is (and the most accidents happen by the present system) that up to at least one thousand cars, being ranged in one track, can be coupled at once by a single shock of the engine so that no one is obliged to pass between the cars or handle something. Further, the attention is called to the fact that my patent car coupling is not fixed, like others, on the car-box, but is fixed on the car-truck, and this cause prevents the cars, while passing a curve, from coupling apart or jumping out of the track. Every one of all them other 1,000 car couplings being out, is unable to fulfill this very needful requirement. My car coupling works just as well, easy, safe and sure in curves as it does in a straight line, because the same takes direction with the tracks; also, the cars can be coupled apart in curves as well and safe as in a straight course. After all, it can be seen that this new car coupling invented by me is not a humbug at all, it can be learned that it is something grandious, and that the coupling and coupling apart of the cars, after my system, can be done with an enormous rapidness and lightness, and that large savings of money, as well as men, can be resulted with the cars being supplied with my car coupling, and that no accident of any kind can happen to any human being."

This lucid explanation clearly shows the advantages of the Buffalo man's invention, and railroad companies will doubtless hasten to adopt it.

American Car Heaters Abroad.

It is stated that the Young Safety Heating and Lighting Company, of St. Paul, has received an order from a Scotch road to equip a passenger train.

Spanish Railways.

For the last thirty-three years the Spanish Government has encouraged the building of railways by paying subsidies during the progress of laying down the line. A bill has, however, now been introduced which will alter this arrangement, and which is intended to develop secondary lines of one-metre gauge. It is proposed to assist these by guaranteeing the payment of 5 per cent. interest on the capital invested. The cost is not to exceed $25,000 per mile. It is expected that the passing of this bill will give a great impetus to the construction of lines of this nature.

Natural Gas in England.

Last June a "blower" of natural gas was struck in the underground workings of the Hebburn Colliery, near Newcastle-on-Tyne, and remained for fully six months a source of annoyance and danger to all in the pit. At the commencement of the present year—as the flow seemed likely to be permanent—it was decided to utilize it by running a 6-in pipe from the "blower" to the surface, and burning the gas under some one or more boilers. On the 26th of February the gas was successfully lighted in a large Lancashire boiler, which has continued to work steadily ever since. It is believed that the flow is sufficient to supply four boilers, and three others are accordingly to be connected with the gas main. The gas is introduced to the boiler flue by an annular burner, the flame being afterwards broken up and spread by a brick bridge placed about 7 ft. from the front end. The evaporative power of the gas is great, and the arrangement, when complete, is expected to result in a saving for fuel and labor of about $15,000 per annum.

Railroads for Chili.

The following announcement is made by Mr. Edward Shippen, Chilian Consul in Philadelphia: The Chilian Government has decided to build about eight hundred miles of railroad at an approximate cost of $17,000,000. To that effect the public is invited to send sealed proposals for the construction of said road, either for the total mileage or by sections.

The sealed proposals will be opened and taken into consideration at Santiago de Chile on the 30th of July, 1888. For further information apply to the Chilian Legation, in Washington, General Consulate of Chili in New York, or to the Consulate, 532 Walnut street, Philadelphia.

A New Kansas Industry.

The authorities of Wichita, Kan., are ridding the town of tramps by shipping them west in freight cars labeled "Perishable." Freight is paid for fifty miles.

History does not relate the remarks made at the receiving station, when the pie is opened and the four and twenty blackbirds begin to sing. It would be interesting to know whether this Kansas classification of "Perishable" applies to the genus crank, who is evidently imperishable, everlasting and always with us.

Asiatic Railroads.

We never for a moment doubted that Russia would carry the Central Asia Railway on to the Pacific. The news, therefore, that General Annenkoff, the constructor of the Russian Railway from the Caspian to Bokhara, has left Central Asia for Siberia, where he is to examine the proposed line of railway to the Pacific, comes with no surprise. He expresses himself confident that he can complete a railroad from European Rusisa to Vladivostock in three years. And he is likely to keep his word.

A junction with the Quettah Railway, say at Merv, and a branch running down through Persia to the Indian Ocean. This is a dream indeed. But, who will say it is delusive or shadowy? Warlike fears alone intercept the vision, but the absence of these railways would not prevent war: on the contrary, railways are the greatest promoters of international amenities.—*Herapath's.*

A Venetian Ship Railway.

An interesting achievement of the fifteenth century was recently described by Mr. E. L. Corthell before the Engineers' Club of Philadelphia. Brescia, an inland city of

immense strength, was besieged by the Milanese. Upon Lake Garda near it were the fleets of the besieging forces. About a hundred miles distant was Venice, apparently unable to cope with the problem of relieving Brescia. An engineer named Sorbolo proposed to the Doge and Senate to take a fleet of war ships up the Adige to the limit of navigation and thence to transport them overland to Lake Garda. By exhibiting a model of his proposed apparatus, he succeeded in inducing them to try his project. Two first-class and four second-class galleys and twenty-five light barques were prepared, armed and provisioned and taken up the Adige to the point nearest the lake. Here they were placed on cradles while afloat, and each galley was drawn up the incline to the plain by 600 oxen. Half that number could draw the largest ship on the level, as the ground was frozen hard, and the galleys were drawn in an imposing procession by nearly three thousand oxen over thirty miles of level plain. The army accompanying the ships was provided with tools, crowbars, shovels and the like, so as to remove obstructions. When Mount Pineda was reached, a roadway was made over it, and the ships were hauled up on one side and lowered down the other by windlasses. As they ascended they were wedged foot by foot to prevent an escape. On the descent one vessel broke loose and was dashed to pieces. The other vessels accomplished the descent in safety and crossed the remaining space of 12 miles, and in February, 1439, the entire fleet was afloat on the waters of Lake Garda. A second fleet was successfully sent there by the same route a year later. The work was done under the superintendence of Sorbolo, the originator of the scheme.

The largest vessels were nearly 150 ft. long and about 40 ft. wide. The success of such an operation before the days of steam and railroads is an augury for the success of ship railways. In the four and a half centuries that have elapsed since then, the size of ships has not increased so rapidly as have the resources at the disposal of engineers for their land transportation.

RAILROAD LAW—NOTES OF DECISIONS.

Injuries to Passengers, Employes and Strangers.

In Texas at a station a switch-engine was run against a car from which plaintiff was attempting to alight, causing him to be thrown across the seats of the car, and thus inflicting injuries upon him. The evidence showed that he had been hurt by falling, but cured before this accident, and defendant complained that its liability was made to depend, in the instruction of the court, upon whether the force of the engine was sufficient to throw plaintiff down, instead of a person of ordinary physical ability. The Supreme Court decides that railroad companies are presumed to know that persons in feeble health travel upon their trains, and must exercise care accordingly, and are therefore liable for injuries of this character.[1]

In Kansas the Supreme Court rules that where a passenger is rightfully in a railroad car, in the possession of a ticket entitling him to a ride on that trip and train, and is deporting himself in a becoming and proper manner, and presents his ticket to the conductor when called upon therefor, but is informed by the conductor that his ticket will not be honored, because the time to ride thereon has expired, and that he must either leave the train or pay his fare, and, not having any money, he does not pay the fare demanded, and thereupon the conductor takes hold of his coat collar, and leads him out of the car to the platform of a station; and when off the car a friend of his gives him money to pay the extra fare, and the conductor accepts the fare, and then permits him to ride to his destination, even if the conductor acted in good faith, and in the honest belief that the passenger had no right to ride upon the ticket he presented, he is entitled to recover from the railroad company the amount of the extra fare paid by him, with interest, and also actual compensation for the injury and indignity to which he was subjected. But if there was such a reckless indifference to the rights of the passenger as to establish gross negligence, amounting to wantonness, on the part of the conductor, in examining the ticket presented by the passenger, and in ejecting him from the car, he is also entitled to recover exemplary damages.[2]

In Missouri the trial Judge had instructed the jury that a railroad company is bound to exercise the strictest vigilance and care in carrying passengers to their destination *and in setting them down safely thereat.* On appeal the Supreme Court holds that the words italicized are bad law. The Court say: "All the duty the law imposes upon a conductor, acting as the agent of a corporation, in order to comply with the obligation of the carrier to a passenger, is to carry him safely to his point of destination, announce the arrival of the train at the station, and give him a reasonable opportunity to leave the cars. When this is done the duty of the conductor ceases. And when the servants of a corporation, engaged in the business of a common carrier, afford passengers a reasonable time to leave the cars after arrival at the end of their journey, they have the right at the expiration of such reasonable period to presume that all the passengers whose place of destination is then reached have done what is customary for passengers in like circumstances to do, to wit, have left the cars. When such a reasonable time has thus elapsed, it is no part of the duty of the servants of such corporation to make personal inspection of, or to interrogate the remaining passengers, to see whether they intend leaving the cars. The law imposes no such onerous duty upon a carrier of passengers."[3]

In Indiana the Supreme Court holds that a conductor in charge of a passenger train is the general agent of the carrier so far as concerns the rights of passengers in alighting from the train.[4]

In Kansas the Supreme Court, in an exhaustive opinion, lays down the rule that street railway companies are bound to exercise all possible skill, foresight and care in the running of their cars, so that passengers may not be exposed to danger on account of the manner in which the cars are run. "All possible skill and care" imply that every reasonable precaution in the management and operation of street cars be used, to prevent injuries to passengers. They mean good tracks, safe cars, experienced drivers, careful management, and judicious operation in every respect. "All possible foresight" means more than this. It means anticipation, if not knowledge, that the operation of street cars will result in danger to passengers, and that there must be some action with reference to the future; a provident care to guard against such occurrences; a wise forethought and prudent provision that will avert the threatened evil, if human thought or action can do so. This rule applies to all kinds of passenger carriers, by steam, by horses in cars drawn over rails, or in ordinary vehicles as omnibuses or stages, the only difference being in the means and instrumentalities used, not to the degree in which the preventive means are to be applied.[5]

In Texas, in an action for injury to a passenger alleged to have been caused by the train suddenly starting while he was alighting from it, contributory negligence having been pleaded as a defense, 11 witnesses, many of them disinterested, testified that the train stopped long enough to allow passengers to alight safely; and their testimony was only contradicted by that of plaintiff and two boys. Two disinterested witnesses testified that plaintiff had left the car and was standing on the ground when the train started. Several witnesses testified that the usual signals were given before the train started. The Supreme Court rules that a verdict for the plaintiff was against the weight of evidence and must be set aside.[6]

In Tennessee the plaintiff, a carpenter, working on a railroad trestle, intending to descend to a lower bent, asked the foreman of his gang, who was above him on the trestle, if a certain hanging rope was made fast. On answer that it was, plaintiff swung himself off, and, the rope being loose, was thrown to the ground and injured. It appeared that plaintiff's descent was without orders of the foreman, and might have been made another way; that he did not tell the foreman of his intention to descend; and that no duty rested on the foreman to see to the means of descent. The Supreme Court holds that the foreman's negligence was merely personal, and not as of a vice-principal, and that plaintiff could not recover from the railroad company.[7]

In the same state the Supreme Court rules that for an employé of a railroad company who had boarded the pay train to receive the amount due him for his services as such employe, and, having completed his business, to attempt to alight from the train which was then moving, is not such contributory negligence *per se* as will defeat a recovery for injuries sustained. In the same case it is held that in a suit by the widow against a railroad company for damages for negligence by reason of which her husband sustained injuries resulting in his death, it being shown that the deceased was 57 years of age, in declining health, his monthly earnings small, and there was evidence tending to show contributory negligence on his part, a verdict for $12,000 was excessive.[8]

In Connecticut the Supreme Court of Errors rules that where an officer of a railroad, in an action for damages for the death of an employé, testified that in his opinion the rules and regulations of the company in reference to giving notice to employés of the running of extra trains, at the time of the accident in suit, were reasonable and sufficient, it was proper to permit him to be asked, on cross-examination (not for the purpose of showing negligence on the part of the company, but merely to show an inconsistency with his former statement), whether an additional regulation was not made after the accident.[9]

In Georgia the company put into its train one car of a different kind and higher than those generally used; while standing on said car, whither he had gone in discharge of his duty as brakeman, the train passed under a bridge, and the brakeman was thrown off and killed; several persons were looking towards him at the time, but gave him no warning, seeming to apprehend no danger. These facts the Supreme Court hold show negligence in the company for the result of which they are responsible.[10]

In Missouri the Supreme Court rules that it is negligence for a railway company to cut a car loose and permit it to run across a public highway, unguarded and unattended, and in such a manner as to endanger travelers passing along or across said highway. While it is the duty of a traveler on a public highway crossing a railway to use his eyes and ears as an ordinarily prudent person would under similar circumstances, yet he is not bound to anticipate such an act of negligence on the part of another.[11]

[1] East Line & R. R. Co. v. Rushing, 6 S. W. Rep., 834.
[2] South. Kan. R. Co. v. Rice, 16 Pac. Rep., 817.
[3] Hurt v St. L., I. M. & S. R. Co., 7 S. W. Rep., 2.
[4] L., N. A. & C. R. Co. v. Wood, 13 West. Rep., 319.
[5] Topeka City R. Co. v. Higgs, 16 Pac. Rep., 667
[6] S. C. & S. F. R. Co. v. Williams, 7 S. W. Rep., 88.
[7] L. & N. R. Co. v. Labr, 6 S. W. Rep., 663.
[8] L. & N. R. Co. v. Slacker, 6 S. W. Rep., 737.
[9] Quinn v. N. Y., N. H. & H. R. Co., 5 N. E. Rep., 685.
[10] Stirk v. Cent. R. Co., 5 S. E. Rep., 105.
[11] O'Connor v. Mo. Pac. R. Co., 7 S. W. Rep., 106.

General Railroad News.

MEETINGS AND ANNOUNCEMENTS.

Dividends.

Dividends on the capital stocks of railroad companies have been declared as follows:

Boston & Providence, $5 per share, payable May 2; also $32.50 bonus received by the lease to the Old Colony.

Concord, annual, 5 per cent., payable May 1 to stockholders of record, April 14.

Railroad and Technical Conventions.

Meetings and conventions of railroad associations and technical societies will be held as follows:

The American Society of Mechanical Engineers will hold its seventeenth meeting at the Maxwell House, Nashville, Tenn., May 8 to 11.

The *American Train Dispatchers' Association* will hold its fifth annual meeting at Louisville, Ky., June 12.

The *National Association of General Passenger and Ticket Agents* will hold its fall meeting in Saratoga, N. Y., Sept. 18.

The *National Association of General Baggage Agents* will hold its next meeting in New York City July 18.

The *Master Car-Builders' Association*, annual convention, Alexandria Bay, N. Y., commencing June 12.

The *American Railway Master Mechanics' Association*, next annual convention, Thousand Islands, N. Y., June 19.

The *New England Railroad Club* meets at its rooms in the Boston & Albany passenger station, Boston, on the second Wednesday of each month.

The *New York Railroad Club* meets at its rooms, 113 Liberty street, New York City, on the third Thursday of each month.

The *Western Railway Club* meets in Chicago the third Wednesday in each month.

The *Central Railway Club* meets at the Tifft House, Buffalo, the fourth Wednesday of January, March, May, August and October.

The *American Society of Civil Engineers* holds meetings on the first and third Wednesday in each month at the House of the Society, 127 East Twenty-third street, New York.

The *Boston Society of Civil Engineers* holds its regular monthly meetings at its rooms in the Boston & Albany station, Boston, at 7:30 p. m. on the third Wednesday of each month.

The *Western Society of Engineers* holds its regular meetings at its hall, No. 15 Washington street, Chicago, at 7:30 p. m., on the first Tuesday of each month.

The *Engineers' Club of St. Louis* meets the first and third Wednesday of each month till June.

The *Engineers' Society of Western Pennsylvania* meets in Pittsburgh the third Tuesday of each month.

Meetings.

Meetings of the stockholders of railroad companies will be held as follows:

Atchison, Topeka & Santa Fe, annual meeting, Topeka, Kan., May 10.

Baltimore & Cumberland Valley Extension, special meeting, Chambersburg, Pa., April 27.

Bay View, Little Traverse & Mackinaw, annual meeting, Harbor Springs, Mich., May 2.

Canadian Pacific, annual meeting, Montreal, Que., May 9.

Chicago, Burlington & Quincy, annual meeting, Chicago, Ill., May 16.

Chicago & Northwestern, annual meeting, at the office in Chicago, Ill., June 7.

Chicago & Ohio River, annual meeting, Grand Pacific Hotel, Chicago, Ill., May 3.

Chicago, Rock Island & Colorado, special meeting, Denver, Col., April 30.

Connecticut River, special meeting, at the office in Springfield, Mass., May 4.

Delaware & Hudson Canal Co., annual meeting, 21 Cortlandt street, New York, May 8.

Detroit & Bay City, annual meeting, Detroit, Mich., May 3.

Eastern, in New Hampshire, annual meeting, Portsmouth, N. H., May 1.

Harrisburg & New England, annual meeting, Philadelphia, Pa., May 7.

Kansas City, Fort Scott & Springfield, special meeting, Kansas City, Mo., April 20.

Kansas City, Springfield & Memphis, special meeting Kansas City, Mo., April 20.

Lake Shore & Michigan Southern, annual meeting, Cleveland, O., May 2.

Lehigh & Eastern, special meeting, Philadelphia, Pa., May 29.

Louisiana & Missouri River, annual meeting, St. Louis, Mo., May 2.

Missouri, Kansas & Texas, annual meeting, Parsons, Kan., May 16.

Michigan Central, annual meeting, Detroit, Mich., May 3.

New York, Chicago & St. Louis, annual meeting, Cleveland, O., May 2.

Norfolk & Western, annual meeting, Roancke, Va., May 2.

Omaha & St. Louis, annual meeting, Stanberry, Mass., May 15.

Pittsburgh, Fort Wayne & Chicago, special meeting, Penn avenue and 10th street, Philadelphia, Pa., June 13.

Pennsylvania & Western, Philadelphia, Pa., May 2.

Richmond & Danville, special meeting, Richmond, Va., May 21.

St. Louis, Arkansas & Texas, annual meeting, St. Louis, Mo., May 3.

Topeka, Salina & Western, annual meeting, Topeka, Kan., May 1.

Union Pacific, annual meeting, 101 Tremont street, Boston, Mass., April 25.

Vicksburg & Meridian, annual meeting, 40 Wall street, New York, May 7.

Washington, Western & Southwestern, special meeting, Staunton, Va., April 26.

Master Car-Builders' Association.

The following circulars have been recently issued:

STANDARD AXLE FOR CARS OF 60,000 LBS. CAPACITY.

NEW YORK, April 8, 1888.

Since the last annual convention of the association, the form and dimensions of a proposed standard axle were submitted to letter ballot for adoption, and failed to receive two-thirds of the votes cast, which are required to adopt a standard. As the subject is an important one and is likely to come up for consideration again, it has been thought by the Executive Committee that it would be well to get the views of the members of the association before the meeting of the next convention, in order to be prepared to take some action at that time which would be acceptable to a majority of the members. You are, therefore, requested to fill out the dimensions which you would recommend for a standard axle for cars of 60,000 lbs. capacity, on the accompanying engraving, and return to the secretary with your signature appended. Respectfully,

M. N. FORNEY, Sec'y,
45 Broadway, New York.

THE BEST FORM OF DOOR HANGINGS, INCLUDING GRAIN DOORS.

The undersigned committee, appointed to consider the above subject and report at the convention to be held in June, 1888, desire to obtain replies to the following questions:

1st. What kind of side door and door hangings are you using on freight cars?

2d. What grain doors are you using, and are you satisfied with the workings of same?

3d. Are you using any patent doors and hangings, and what is your opinion of same?

4th. What is your opinion of a flush door, and what kind have you used?

Please address replies to this circular to E. W. Grieves Baltimore & Ohio, Mt. Clare, Baltimore, Md.

E. W. GRIEVES,
JOHN P. LEVAN,
JOHN VOORHEES.

APRIL 3, 1888.

STANDARDS AND APPLIANCES FOR THE SAFETY OF TRAINMEN.

NEW YORK, April 8, 1888.

The Railroad Commissioners of the State of New York report that during the year ending Sept. 30, 1887, there were 199 railroad employés killed and 896 more or less severely injured in the performance of their duties. These accidents are classified as follows:

	Killed.	Injured
Fell from train, engine or cars, or getting on or off trains	48	152
Striking low bridges, switches, tunnels, etc.	8	9
Coupling or uncoupling cars	20	437
Walking or being on track	102	88
Catching foot in frog or between rails	4	7
Derailment	1	19
Collisions	6	40
Other causes	10	144
	199	896

According to Poor's Manual, the number of locomotives owned by railroads in the state of New York in 1886 was 2,722, and in the whole country 26,415. It will be quite safe to say that there were ten times as many locomotives in the whole country as there were in New York state during the period covered by the Railroad Commissioners' report. If the average number of persons killed and injured per locomotive is the same elsewhere, the number of casualties to railroad employés in the whole country would be ten times the above figures, or a total in round numbers of 2,000 killed and 9,000 injured.

No pretense is made that this estimate gives the number of employés killed and injured with anything more than an approximation to accuracy. It must be remembered, though, that whatever errors there may be in the reports of accidents to the Railroad Commissioners, and of the number of locomotives in the country, are errors of omissions, and that probably both the number of accidents and of locomotives are greater than reported, which would make the above estimate too low rather than too high. Nevertheless, with any reasonable deduction the record of frightful suffering,

pain and sorrow will be more than sufficient to emphasize the following inquries, the aim of which is to elicit information that will indicate how the number of such accidents may be diminished.

All railroad officers and employés, whether members of the Master Car-Builders' Association or not, are therefore requested to answer the following questions:

1. What defects are there in the present construction of cars and locomotives which cause accidents to railroad employés by falling from trains, engines or cars, or of accidents in getting on or off trains?
2. What changes could be made in cars or locomotives which would diminish the number of such accidents?
3. What kind of couplers and dead-blocks are the most dangerous to employés in coupling cars?
4. What kind of coupler and dead-blocks do you think is the least dangerous to employés?
5. Has the introduction of automatic couplers thus far lessened the danger of coupling cars?
6. Would the general introduction of automatic couplers in your opinion diminish the danger of coupling cars?
7. Can you suggest any way of lessening the number of accidents to employés from "walking or being on the track?"
8. How can employés be prevented from "catching their feet in frogs or between rails?"
9. In what way may other kinds of accidents to employés be prevented or the number lessened?

All railroad officers and employés, who see this circular, are earnestly solicited to answer it, and thus add the weight of their testimony in helping to reduce the terrible sacrifice of life and limb which is annually exacted from our railroad employés.

JOHN KIRBY, M. N. FORNEY, } Committee.

Replies to the above questions should be sent to M. N. Forney, 45 Broadway, New York.

CONTOUR LINES FOR M. C. B. STANDARD AUTOMATIC CAR-COUPLERS.

NEW YORK, April 8, 1888.

An engraving is sent herewith which shows the form of contour lines for the Master Car-Builders' standard type of car-coupler, which has been adopted by the Executive Committee to consummate the recommendation of the report made to and adopted by the association at its last annual meeting, which was that "the Association procure one of the present makes of Janney type of coupler, selection being made by a committee appointed for that purpose, and that all other forms of couplers that will couple to and with this coupler, under all conditions of service, are to be considered as within the Janney type and conforming to the standard of this association."

The contour lines referred to and shown by the engraving were found to be described in Letters Patent No. 212,703, granted to Eli H. Janney, Feb. 25, 1879, and to be covered by the 8th and 9th claims thereof.

The owners of said patent, in consideration of the adoption of the Janney type of coupler as the Master Car Builders' standard type of freight car coupler, have agreed to waive their rights secured by said 8th and 9th claims, in favor of all railroad companies members of this association and the Eastern and Western Railroad Associations, which may decide to adopt the Master Car-Builders' type as their standard; and an agreement has been perfected whereby each railroad company may secure a license covering the right to make and use freight car-couplers containing said contour lines on making application therefor to William McConway, Vice-President of the Janney Hein Coupler Company, Pittsburgh, Pa.

In making this concession it will be understood that the owners of said patent do not thereby license or convey any right secured to them by the other claims of said patent or by any other patents owned or controlled by them.

In order to secure uniformity in the dimensions of the stem, dead-blocks and carrier irons and proper protection for the Master Car-Builders' type of coupler, the Executive Committee recommend the dimensions given in the accompanying engravings (figs. 1, 2, 3, 4 and 5). The committee are of the opinion that double dead-blocks or bumpers should invariably be used with this type of coupler. The contour lines are now the standards of the association, and it is the purpose of the Executive Committee to submit its recommendations with reference to the dimensions of stem, etc., and the use of dead-blocks, for adoption as standards at the next convention of the association.

By order of the Executive Committee.

M. N. FORNEY, Secretary,
45 Broadway, New York.

The illustrations referred to will be found in our double page illustration.

American Railway Master Mechanics' Association.

The following circulars have been recently issued.

The twenty-first annual convention will meet at Alexandria Bay, N.Y., at 9 a. m., on June 19. The headquarters of the association will be in the "Thousand Island House," and rooms for members and their families may be obtained there on application to Mr. R. H. Southgate. The terms are $3 per day.

Alexandria Bay is in the Thousand Islands region, on the New York side of the St. Lawrence, near the outlet of Lake Ontario, and twelve miles from Clayton, on the Rome, Watertown & Ogdensburg. Boats connect for Alexandria Bay with all trains arriving at Clayton. Connections are made at Suspension Bridge, Niagara Falls, Rochester, Syracuse, Rome and Utica with the Rome, Watertown & Ogdensburg. Parties from the east can make connection by the Ogdensburg & Lake Champlain, and passengers on the Grand Trunk can make steamboat connection at Kingston for Clayton or at Gananoque for Alexandria Bay. Excursion tickets will be sold after June 1 from all points on the Rome, Watertown & Ogdensburg to Alexandria Bay and return.

Further particulars may be obtained from the Committee of Arrangements: H. M. Britton (Rome, Watertown & Ogdensburg), Oswego, N. Y.; R. C. Blackall (Delaware & Hudson), Albany, N. Y.; J. Davis Barnett (Grand Trunk), Port Hope, Ont., or from Angus Sinclair, Secretary, 175 Dearborn Street, Chicago.

REPLIES TO CIRCULARS OF INQUIRY.

Several chairmen of committees of investigation have complained that very few replies have been received to their inquiries. As reports have to be sent to the Secretary, before the meeting of the annual convention, it is necessary that members should reply to the circulars immediately. Members are urged to attend to this matter at once. For the Advisory Committee, ANGUS SINCLAIR, Secretary.

Engineers' Club of Kansas City.

A regular meeting was held April 2. A letter from Mr. L. E. Cooley to the Committee on National Public Works stated that delegates from the various engineering societies would meet in Washington, April 9 and 10, and requested that the Kansas City club send a representative. The selection of a delegate was left to the executive committee, the club to pay his expenses. Contributions to the discussion of the evening were read from C. E. H. Campbell, L. G. F. Bouscaren, George L. Vose, William H. Burr, C. L. Strobel and A. J. Tullock. It was voted to read other discussions which had been presented at an adjourned meeting to be held April 16. The following members were elected: C. C. Silman, Robert Gilham, Charles S. Brown, James H. Grove, E. J. Remillon and Frank Allen. J. B. Hodgdon and J. K. Musselman were elected associates.

PERSONAL.

—John Muir, Traffic Manager of the Chesapeake & Ohio, has resigned to take effect May 1.

—Col. Charles Scranton died last week at Oxford, N. J., at the age of 66. He was associated with his brothers, G. W. and S. T. Scranton, in building the Delaware, Lackawanna & Western Railroad and in founding the city of Scranton, Pa.

—Col. James Mackaye, who organized the express firm of Wells, Fargo & Co. and the American and the United States Express companies, died last week in Paris, where he has resided most of the time for nearly 20 years. He was born in 1804 in Argyle, N. Y.

—C. F. Waldo, the retiring Division Superintendent of the Wisconsin Central, was given a banquet by the employés of the road last week in Stevens Point, Wis., and presented with a gold watch and chain, engraved and set with diamonds, valued at $500. Mrs. Waldo was also made the recipient of a valuable silver water service.

—Mr. M. L. Lum has resigned as Chief Engineer of the Chesapeake & Ohio and Newport News & Mississippi Valley, to take effect April 15. He has held the position for four years on the Chesapeake & Ohio, and eight years on the Newport News & Mississippi Valley. The office of chief engineer on the Chesapeake & Ohio has been abolished.

—Thomas Silver, the inventor of the well-known governor for marine engines, died in New York on April 12, aged 74. His governor was invented in 1854 and was first applied in 1855 on the steamer *Atlantic* of the Collins line. It was largely adopted, especially in Europe. Mr. Silver's latest inventions were a mechanical lamp and a lamp burner made to dispense with glass chimneys.

—William Merritt, for a number of years Superintendent of the Boston & Maine, died April 15 at his residence in East Somerville, Mass., of paralysis, at the age of 74. He had been in poor health for several years. He was General Freight Agent of the Boston & Maine from 1852 to 1856, and was then promoted to be Superintendent of the line, which place he held for 17 years, retiring in 1873. His three sons are in the railroad service, one of them being Division Superintendent of the Boston & Maine.

ELECTIONS AND APPOINTMENTS.

Baltimore & Ohio.—Charles O. Scull has been appointed General Passenger Agent, to succeed C. K. Lord, who has been chosen Vice-President.

Chicago, Rock Island & Colorado.—C. L. Canfield has been appointed General Agent at Helena, Mont.

Cincinnati, Jackson & Mackinaw.—J. B. Flanders has been appointed Superintendent of the Michigan Division, with office at Toledo, O.

Cincinnati, Lebanon & Northern.—At the annual meeting last week the following directors were elected: George Hafer, A. D. Bullock, E. S. Brown, A. S. Winslow, J. N. Kinney, Briggs Swift and J. M. W. Neff.

Cincinnati, Wabash & Michigan.—At the annual meeting of the stockholders the following directors were elected: J. H Wade, H. B. Payne, William Bingham, F. W. Pelton, R. E. Mix, J. H. Wade, Jr., W. S. Jones, John Newell; C. P. Leland, Cleveland, O.; C. Cowgell, of Wabash, Ind., and Norman Beckley, of Elkhart, Ind. J. H. Wade was elected President; William Bingham, Vice-President and Secretary, and W. S. Jones, Treasurer.

Cincinnati, Washington & Baltimore.—At the annual meeting last week the old board of directors were re-elected except that William M. Greene was elected to succeed J. L. Heck.

Colorado & California Short Line.—Organized in Colorado with the following officers: President, Donald Fletcher; Vice-President, W. J. Barker; Second Vice-President and General Manager, H. M. Aller, of Leavenworth, Kan.; Secretary, T. C. Henry; Treasurer, R. W. Woodbury.

Duluth, Red Wing & Southern.—The Duluth & Red Wing Construction Co., which has been organized to construct this road, has elected the following officers: President, L. F. Hubbard; Vice-President, T. B. Sheldon; Secretary, F. W. Hoyt; Treasurer, G. H. Crary, of Red Wing, Minn.

Golden & Denver.—The following are the officers of this company: President, J. C. Hodges, Jr., Golden, Col.; Secretary, H. Wist, Denver, Col.; Treasurer, A. Townshend, Golden; Chief Engineer, Edward S. Berthoud, Golden.

Illinois Central.—R. J. Williams has been appointed Northwestern Freight Agent, with office in St. Paul, Minn., to take effect May 1.

Joliet, Aurora & Northern.—George Clinton has been appointed General Superintendent.

Kansas City, Clinton & Springfield.—The following officers have been elected: President, George H. Nettleton; Secretary and Treasurer, C. Merriam; Auditor, J. S. Ford.

Kansas, Odessa, Fort Stockton & San Antonio.—The directors of this new Kansas company are as follows: James Hindman, of Zanesville, O.; E. H. Sabin and L. M. Gregory, of San Antonio, Tex.; B. K. Brant, of Odessa, Tex.; Hart Mussey, of Fort Stockton, Tex.; William O. Kulp, of Davenport, Ia.; S. A. Johnston, of Pittsburgh, Pa., and G. W. Cary and M. B. Henry, of Topeka, Kan.

Lenox & Avondale.—The incorporators of this company are as follows: Perry H. Smith, Samuel McConnell, Frank L. Faul, William Burke and John S. Burke, of Chicago, Ill.

Litchfield, Carollton & Western.—The following directors were elected at the annual meeting last week: W. H. Ellis, of Greenville, Ind.; L. P. Peebles, of Carlinville, and Marcus Hook, of Jacksonville, to succeed S. M. Grubbs, of Litchfield.

Long Branch & San Pedro.—The directors of this new California company are: J. M. Leach, Harvey L. Bissell, E. Bouton, James Campbell and John W. Green.

Long Island.—The following appointments have been made: H. M. Smith to be Traffic Manager, vice B. Norton; S. F. Brigham, to be Passenger Agent; W. W. Kinger, to be Paymaster; M. H. Hubbell, to be Superintendent of Express, vice C. E. Topping, resigned; Thomas Stenson, to be Superintendent of Telegraph; H. J. Quigg, to be Train Master, vice C. R. Fitch, who is promoted to Assistant Superintendent.

Mexican Central.—Charles McCotter has been appointed Assistant Superintendent of the Tampico Division.

Milwaukee, Lake Shore & Eastern.—J. W. Sherwood has been appointed Superintendent of the Northern Division, with headquarters in Ashland, Wis., vice J. S. Jones, resigned.

Mobile & Ohio.—W. H. Scholes has been appointed Superintendent of the Northern Division, with office at Jackson, Miss.

Mobile & Southeast Alabama.—The following are the incorporators of this Alabama company: J. M. Leinkauf, S. D. Brown, Samuel Brown, J. M. Davidson, Harry Pillams, Adam Glass and F. W. Burke.

Montana Central.—Samuel J. Beals has been appointed Secretary and Treasurer, vice William Harrison, resigned.

New Orleans & Eastern.—The following directors and officers were elected at the annual meeting last week: Directors, Charles Schiff, Jules Aldige, Alfred Slidell, Robert Mott, John Glynn, Jr. Officers: Charles Schiff, President; John Glynn, Jr., Secretary and Treasurer; E. L. Tyler, Superintendent.

New York Central & Hudson River.—At the annual election held in Albany, N. Y., the old board of directors were re-elected.

Ohio Southern.—The following directors were elected at the annual meeting held in Springfield, O., last week: Alfred Sully, Austin Corbin, J. R. Maxwell, Henry Graves, Dumont Clark, R. K. Dow, of New York; William N. Whitely, Amos Whitely and H. L. Chapman, of Springfield; H. S. Hilliard, of Wellston; Isaac Brown, of Jackson, and H. H. Weakly, of New Carlisle.

Old Colony.—The following officers have had their authority extended over the Boston & Providence: Isaac N. Marshall, Division Superintendent (in addition to his duties as Superintendent of the Northern Division), with headquarters in Boston, S. C. Putnam, General Freight Agent; George L. Connor, General Passenger and Ticket Agent; J. N. Lauder, Superintendent of Rolling Stock, and George S. Morrill, Chief Engineer, Boston. All construction work, including new stations and rebuilding of bridges, now in progress, will be under the charge of S. L. Minot.

Omaha, Kansas & El Paso.—The following are the officers of this company: President, John D. Ellwood; Vice-President, J. B. Arthur; Secretary, W. S. Hebron; Treasurer, C. A. Read; Attorney, M. S. Wilson, all of Kinsley, Kan.

Orange Belt.—J. H. Sullivan has been appointed Superintendent, with headquarters in Oakland, Fla.

Oregon Pacific.—F. J. Miller has been appointed Superintendent of Bridges and Buildings.

Pemberton & Hightstown.—The following board of directors was elected last week: W. J. Sewell, J. N. DuBarry, W. H. Wilson, Hugh B. Ely, C. B. Meirs, W. N. Bannard, Wm. Taylor, C. B. Simms and Henry D. Welch. W. J Sewell was elected President, Hugh B. Ely Secretary and Wm. Taylor Treasurer.

Philadelphia & Reading Terminal.—The directors of this company, which was lately organized for the purpose of constructing an elevated road and terminal station in Philadelphia for the Philadelphia & Reading, are as follows: Austin Corbin, President; Stephen A. Caldwell, J. R. Maxwell, A. A. McLeod, T. Morris Perot; J. D. Campbell, of New York, and Wharton Barker.

Richmond & West Point Terminal.—John H. Inman has been chosen President, to succeed Alfred Sully, resigned.

St. Ignace, Sault Ste. Marie & Northern.—The following officers of this New Michigan company have been elected: William Chandler, of Sault Ste. Marie, President; James Reid, of St. Ignace, Vice-President; Otto Fowle, of Sault Ste. Marie, Secretary; W. A. Burt, of St. Ignace, Treasurer; George Cox, St. Ignace, Chief Engineer; J. H. Goff, Sault Ste. Marie, Attorney.

San Francisco, Clear Lake & Humboldt.—The following are the officers of this company: President, W. H. H. Hart; Secretary, J. F. Fassett. The general office is at 230 Montgomery street, San Francisco, Cal.

Spokane & Montrose Motor.—The following are the officers of this new company: Francis H. Cook, President and Treasurer; E. A. Routhe, Vice President; W. J. Farrar, Secretary.

Springfield & Southern.—The following directors were elected at the annual meeting: Amos Miller, Hillsboro; G. Vanhornbek and H. Francisco, Carlyle, Ill.; Lewis Kinghoff, Nashville; Duncan McTaggart, Pawnee, and C. D. Hoibe, Greenville, Ill.

Tacoma, Ellensburgh & Conconully Railway & Navigation Co.—The incorporators of this company are: Louis E. Post, Thomas L. Nixon and T. L. Stiles, of Tacoma, W. T., and Thomas Johnson and T. H. Wilkins, of Ellensburgh.

Troy & Tiptonville.—The following are the officers of this company: President, George B. Wilson; Vice-President, James S. Moffatt; Secretary and Treasurer, W. Brice; Chief Engineer, John B. Inman. The general office is in Troy, Tenn.

Tucson, Globe & Northern.—The following are the officers of this company: W. H. Culver, President; J. C. Handy, Vice-President; Geo. Pusch, Treasurer; Charles E. Walker, Secretary and Chief Engineer; W. W. Walker, General Manager. The general office is at Tucson, Ariz.

Union Pacific.—President Cleveland has appointed the following as Government Directors: Frederick R. Coudert, of New York; Franklin MacVeagh, of Illinois; Alexander C. Haskell, of South Carolina; M. A. Hanna, of Ohio, and James W. Savage, of Nebraska.

Vaudeuil & Prescott.—J. B. A. Mongenais has been elected President, and Albert Hagar, Vice President of this Quebec company.

West Shore.—The old board of directors were re-elected at the annual meeting held this week in Albany.

Wisconsin Midland.—C. B. Bartlett has been elected President, to succeed Hon. A. C. Ruggles. The general office is in Fond du Lac, Wis.

OLD AND NEW ROADS.

New Companies Organized.—Colorado & California Short Line; Kansas, Odessa, Fort Stockton & San Antonio; Lenox & Avondale; Spokane & Montrose Motor; Long Beach & San Pedro; Mobile & Southeast Alabama; Puyallup Valley; Tacoma, Ellensburgh & Conconully Railway & Navigation Co.

Aberdeen, Sioux Falls & Montana.—The survey will, it is said, soon be commenced for this road, which it is proposed to build between Aberdeen and Sioux Falls, Dak. R. E. Kirk, Aberdeen, Dak., is Chief Engineer.

Arkansas Midland.—Work on the extension from Clarendon, Ark, to Little Rock, a distance of about 40 miles, will, it is stated, be commenced this summer. The road is at present in operation between Helena and Clarendon, a distance of 48 miles. J. J. Horner, Helena, Ark., is Vice-President.

Bloomsburgh & Sullivan.—The contracts for an extension from Central, Pa., to a connection with the State Line road at Bereford, will, it is said, soon be let. The road is at present in operation between Bloomsburgh and Central.

Burlington & Missouri River.—The Greely Centre line has been extended from Ord, Neb., 16 miles to Burwell.

California Southern.—Tracklaying has been commenced on the extension from Perris to San Jacinto, Cal. The grading between the two points is finished.

Central Vermont.—An extension of the Ogdensburg & Lake Champlain division from Chateaugay, N. Y., to Chateaugay Chasm will, it is stated, soon be built. It is also said that it may be continued to Hinchinbrook, P. Q., to connect with the road recently incorporated to build from Valleyfield to that point.

Centreville, Moravia & Albia.—The road was sold at public sale last week to W. H. Gebhart, of New York, who represents the bondholders' committee. The price was $25,000, of which $5,000 is to be paid in cash, and the remainder may be paid in bonds. The road extends from Relay to Albia, Ia., a distance of 24 miles, and was originally part of the Wabash, St. Louis & Pacific, but has lately been operated by a Receiver in connection with the Keokuk & Western.

Chicago & Eastern Illinois.—Elliott, Huss & Co., Chicago, Ill., the contractors for the extension of the Chicago & Indian Coal road from Momence, Ill., to a connection with this road at Goodland, Ind., 31 miles, will commence work this week.

Chicago, Kansas & Nebraska.—A survey has been made between Albany, Tex., on the Houston & Texas Central, and Baird, on the Texas & Pacific, a distance of about 20 miles.

Chicago, Milwaukee & St. Paul.—Press dispatches state that the company has decided to construct a line from Spirit Lake, Ia., northeasterly through Jackson, Cottonwood, Brown, Nicollet and Sibley counties in Minnesota, to Glencoe, in McLeod County. It is also stated that the company will build about 200 or 300 miles of new road in Iowa and Minnesota.

Chicago, Rock Island & Pacific.—Carlisle & Price, Pueblo, Col., have been awarded the contract for grading 12 miles of road from Colorado Springs toward Pueblo.

Chicago, St. Paul & Kansas City.—The track is now completed to within four miles of St. Joseph, Mo., and work will soon commence on the extension from St. Joseph to within about 30 miles of Leavenworth, Kan., from which point the tracks of the Kansas City, Wyandotte & Northwestern will be used to Kansas City.

Chicago & South Side Rapid Transit—It is stated that a contract for the construction of this road has been made with the Rapid Transit & Bridge Construction Co. of New York. The company proposes to build an elevated road in Chicago.

Chino Valley.—This narrow gauge road has been completed from Chino to Ontario, San Bernardino County, Cal., and it is stated that it will be extended to a connection with the Anaheim, Olinda & Pamona, at Carlton, and also to Anaheim and San Pedro.

Cincinnati, Hamilton & Dayton.—Contracts have been let for an extension from McComb to Findlay, O. Work is to be commenced by May 15.

Cleveland, Lorain & Wheeling.—A survey is being made from a point on this road about three miles north of Massillon, O. east to Canton. It is stated that it will be continued on to New Lisbon.

Colorado & California Short Line.—This is the name of the Colorado section of the Leavenworth & Denver Short Line. It is said that a survey will at once be made from the Kansas state line, through Denver, to the west line of the state, and that organizations in Utah and further west will at once be effected and the survey continued to the Pacific coast.

Columbus & Western.—The contract for building the freight depot at Birmingham, Ala., has been let to James M. Farland, of Birmingham. It is to be 50 × 500 ft., and to be completed by June 1.

The road has been opened for passenger business from Columbus to Childersburg, Ala., where it connects with the East Tennessee, Virginia & Georgia.

Connecticut River.—A special meeting of the stockholders has been called, to be held in Springfield, Mass., May 4, to decide upon the question of consolidating with the Ashuelot road which extends from South Vernon to Keene, N. H., and is at present operated under a lease.

Covington & Macon.—The road has been completed north from Macon, Ga., through Clinton and Monticello to Madison, 70 miles. The track between Madison and Athens is being laid very rapidly, and it is expected will be completed to Athens, 105 miles from Macon, by July 1.

Cumberland Valley & Martinsburg—The survey has been completed for the extension from Martinsburg to Winchester, Va., 24 miles, and contracts will be let at once. It is a leased line of the Cumberland Valley, of which J. F. Boyd, Chambersburg, Pa., is Superintendent.

Dallas, Archer & Pacific.—It is stated that the contract for building 140 miles of this road from Dallas, Tex., northwest to Archer, has been let. George F. Alford is President.

Denver & Rio Grande.—A three-mile branch has been completed from Florence, Col., south to Coal Creek.

Duluth & Iron Range.—The extension from Tower, Minn., north to the Chandler mine, a distance of 21 miles, has been completed, and will probably be put in operation early in June.

East Alabama.—A survey has been made for the proposed extension from Roanoke, northwest about 40 miles to Anniston.

Elizabethtown & Hodgensville.—The road has been completed southeast from Elizabethtown, Ky., on the Newport News & Mississippi Valley, to Hodgensville, a distance of 11 miles. J. W. Robinette, Elizabeth, is Chief Engineer.

Fitchburg.—The company has negotiated with Kidder, Peabody & Co., of Boston, the $2,000,000 five per cent. 20-year bonds, recently authorized by the stockholders.

Florida Railway & Navigation Co.—The Florida Transit road is advertised to be sold May 7. Securities included in the reorganization are as follows: Florida Transit Co., Fernandina & Jacksonville, Peninsula of Florida, and Florida Central & Western. It is stated that a majority of the holders of these securities have deposited their bonds under the reorganization plan.

Fremont, Elkhorn & Missouri Valley.—Work on the extension southwest from Geneva, the terminus of the Seward branch, to Superior at the Kansas state line, will soon commence. The distance is about 45 miles. McDonald & Penfield, Fremont, Neb., the contractors for the line, have nearly all their outfit at Geneva.

Fresno, Belmont & Yosemite.—The contract for building this short road has been let to W. V. McNasin, Fresno, Cal., and he has commenced work. The survey has been nearly completed. J. Trelman, Fresno, Cal., is Chief Engineer.

Georgia, Carolina & Northern.—Tracklaying has been completed from Monroe, N. C., southwest to Waxhaw, Lancaster County, S. C., and the grading has been completed nearly to Chester.

Golden & Denver.—The locating surveys for this road have been completed, but it has not been decided when contracts will be let. It is to extend from Denver, to Golden, Col.

Grand Rapids & Indiana.—A survey is being made for a proposed extension from Portland to Camden, Ind.

Granite.—Officials of the Central Vermont have had a survey made for this road from Barre, Vt., to the quarries near that place. Citizens of Barre had before this organized a company to construct a road between the same points.

Hereford.—Bids are asked until May 1 for grading the first 35 miles of this road. The company proposes to build a road from a connection with the Upper Coos road near the northern boundary of Vermont, north through the townships of Hereford, Auckland, Clifton and Eaton to a connection with the Quebec Central, a distance of about 50 miles. D. Williams, Cookshire, Province of Quebec, is Chief Engineer.

Illinois Central.—A trust-deed has been filed for record in the office of Secretary of State to secure to the United States Trust Company of New York a loan of $15,000,000 for use in the construction and equipment of new lines, for improvements, and such other uses as the directors may authorize. The mortgage covers the lines of the following companies now held under lease or otherwise: The Yazoo & Mississippi Valley, the Canton, Aberdeen & Nashville, the Chicago, Havana & Western, the Rantoul, the Cedar Rapids & Chicago, the Cherokee & Dakota, and the Chicago, Madison & Northern. The bonds which the mortgage secures are gold interest-bearing 4 per cents, to run 64 years from March 1.

Illinois Valley & Northern.—About 50 miles of track has been laid and the remaining seven miles will soon be completed. The road extends from Walnut, Ill., southeast to Streator, both on branches of the Chicago, Burlington & Quincy, of which the road is virtually a branch.

Kanawha & Ohio.—J. N. Lambkin has been awarded the contract for grading part of the extension from Charleston, W. Va., southeast into Fayette County, lately mentioned in these columns. A force of graders has commenced work between Charleston and Malden. H. D. Whitcomb, Charleston, W. Va., is Chief Engineer.

Kansas City, El Paso & Mexican.—One hundred thousand dollars has been subscribed in El Paso, Tex., toward the building of this road, and it is stated that work will soon commence and be rapidly pushed as far as White Oaks, New Mexico. It is stated that the road will be operated by the Southern Pacific.

Kansas City & Pacific.—A line has been located from Selma, Kan., about 35 miles northeast towards Paoli, Miami County, and the contracts for this and other extensions the company contemplate will be let this and next month. D. W. C Perry, Parsons, Kan., is Chief Engineer.

Kansas City, Wyandotte & Northwestern.—A survey is being made for contemplated extensions from Tonganoxie, Kan., southwest to Lawrence and to Topeka. It is stated that the company is negotiating with the Union Pacific for the purchase of its branch from Lawrence to Carbondale.

Kansas, Odessa, Fort Stockton & San Antonio.—Incorporated in Kansas to construct a road from a point in Bourbon County southwesterly through Bourbon, Neosho, Wilson, Elk, Cowley, Sumner and Harper counties, an estimated distance of 200 miles. The capital stock is $1,000,000.

Kingston & Pembroke.—An extension from Snarbot Lake to Appleton, Ont., a distance of about 42 miles, is said to be under consideration.

Lehigh & Susquehanna.—Work has been commenced on an extension from Siegfried, Northampton County, Pa., southwest to Egypt, on the Ironton road, a distance of about three miles.

Lenox & Avondale.—Incorporated in Illinois to construct a road from Avondale, on the Chicago & Northwestern, south to New Lenox in Will County. The capital stock is $50,000.

Long Beach & San Pedro.—Articles of incorporation filed in California to build a road from Long Beach to San Pedro Harbor, a distance of five miles. The capital stock is $100,000. It is said to be an extension of the Los Angeles & Ocean, of which E. Bouton, Los Angeles, Cal., is President.

Long Island.—The company will soon build an extension from Locust Valley, L. I., four miles to Oyster Bay. There will be some heavy earth work and considerable masonry. Plans can be seen at the office of the Chief Engineer, Anthony Jones, 22 Hanson Place, Brooklyn.

Louisville & Nashville.—Mr. Edward Bates Dorsey has been making a careful examination of the property of this company in the interest of its foreign stockholders. He reports great improvement in its physical condition. The system embraces over 2,000 miles of road, which was originally built for light agricultural traffic. Over 1,000 miles have been laid with steel rails; the bridges have been rebuilt or strengthened, and adapted to the heavy mineral traffic which is now going over the road. The company has lately put in service many 60-ton consolidation engines and freight cars of 30-ton capacity.

Louisville Southern.—Tracklaying has been completed from Lawrenceburg, Anderson County, northwest to within 8 miles of Shelby, on the Louisville & Nashville. A survey has been made east to Burgin, in Mercer County, where connection will be made with the Cincinnati, New Orleans & Texas Pacific.

McKeesport & Bellevernon.—The location is being completed to a point opposite Monongahela City, Pa., and it is expected that grading will soon commence on that part of the road.

Mexican Central.—The track has been completed to Guadalajara and a train will probably go over the road this week. It is stated that construction work on this branch will stop for the present at Guadalajara.

Mexico.—A contract has been made by the Mexican Government with C. Enrique Baz for the construction of a road, without subvention, from a point in the state of Coahulia to a connection with the International. Surveys are to be commenced at once and construction begun within a year. The general office is in Saltillo.

Press dispatches state that a contract has been signed for the construction of a road from Acambaro to a point on the Pacific Ocean, with a branch to connect with the Pacific Division of the Mexican National at Patzcuaro. The road will pass through a country rich in coffee and sugar.

Milwaukee, Lake Shore & Western.—Tracklaying on the extension from Rhinelander, northwest to Hurley, Ashland County, Wis., a distance of about 75 miles, will, it is stated, commence early in summer. The right of way through the Flembeau Reservation has not yet been secured.

Milwaukee, Peoria & St. Louis.—Engineers will commence the survey for this line in a few days. It is projected to extend from Milwaukee southwest through Walworth to Peoria, Ill. Charles A. Haslett is Secretary and Treasurer.

Missouri Pacific.—Soon after the completion of the road from Lexington to Marshall, Mo., tracklaying was suspended, but a force is now preparing the road for the track between Marshall and Boonville, to which point it will soon be completed.

Mobile & Southeast Alabama.—Incorporated in Alabama to construct a road from a point on the Mobile & Birmingham, at or near Brewton, Escambia County, in a general easterly direction through the counties of Escambia, Covington, Coffee, Dale and Henry to Abbeville. It is said that it will also be extended from Brewton to Mobile, and from Abbeville to the Chattahoochie River. The capital stock is $500,000.

Montreal Island.—The company has applied to the Dominion Parliament for a charter to construct a road from Montreal to Maisonneuve, Longue Pointe, Pointe Aux Trembles, St. Laurent and Lachine. Victor Hudon, J. C. Auger, and others of Montreal are interested.

Nevada & California.—This road was built several years ago by the Nevada & Oregon in a general northwest direction from Reno, Nev. (on the line of the Central Pacific), 30 miles to a point in Long Valley, Cal. For the first 24 miles the road passes over a high mountain about 800 ft. above Reno, which is 4,500 ft. above sea level. The maximum grade is over 100 ft. per mile, with curves of 18 deg., the major portion being curved line. When the Nevada & Oregon failed, its property and rights were sold to Moran Brothers, bankers, of New York. In 1884 they extended the road north down the valley seven miles. Last summer a small force was put to work, and up to this date 13 miles more has been completed and trains are running over it. It is expected that after May 1 about 1½ miles of line per week will be completed, and the 92d mile from Reno reached by November. Madaline Plain is 30 miles further, over a 1,200 ft. range. The line from where it enters California runs north, and will lie mainly 18 to 24 miles west of the Nevada line to the Oregon line. The road is owned and being extended by private parties, and there are no bonds or floating debt. The proper name for the road is "Nevada, California, Oregon Railway." The route to Madaline Plain (122 miles) has been surveyed. Erasmus Gest, Reno, Nev., is General Manager.

New Roads.—A road is projected from Mystic, New London County, Conn., west about 6 miles to the Connecticut River. D. D. Mallory, of Mystic, is interested.

Engineers are making a survey from Wilkesbarre, Pa., west through Harvey's Lake to Williamsport.

Two companies of engineers are engaged in making the survey for the road which G. W. Hunt, the contractor of Portland, Or., proposes to build between Wallula and Walla Walla, Washington Territory, and it is stated that work will soon commence on the line.

A company has been incorporated in Quebec to construct a road from Valleyfield, Beauharnois, Province of Quebec, south to Hinchingbrook, near the Vermont line.

A road is projected from Adairville, Ky., the southern terminus of the Owensboro & Nashville division of the Louisville & Nashville, south to Springfield, Robertson County, Tenn., on the same road. The distance is about 15 miles. J. W. Moore, Bevier, Ky., is interested.

New York, Lake Erie & Western.—A survey has been made for a line between Corning, N. Y., and Olean, which is considerably shorter than the present main line.

New York & New England.—In addition to the new fast morning train between Boston and New York, it has been decided to put on a night train, train to leave Boston at 11.30 p. m., and running to New York via Hartford in seven hours. It will be faster than any of the present night trains between the two cities.

Old Colony.—The company took possession of the Boston & Providence April 12, and appointed officers as noted in another column. The road will be known as the Providence Division.

Omaha, Kansas & El Paso.—Surveys will shortly be commenced by this company, which proposes to build a road from Omaha, Neb., to El Paso, Tex. From Russell, on the Union Pacific, to a point on the Texas Panhandle the road will be built this year, it is said. Aid is being voted the company by the counties through which the road will pass. The contracts have not yet been let. The names and addresses of the officers are given in another column.

Ontario Dispatch.—This is the name of the New York, Ontario & Western's fast freight line. It has recently made arrangements with the Rome, Watertown & Ogdensburg, Grand Trunk and the Wabash for through traffic to St. Louis and other Western points via Suspension Bridge.

Oregonian.—It is stated that a branch will soon be constructed from Airlie, Polk County, Or., west to Newport on Yaquina Bay. A bill has been introduced in Congress to grant the right of way across the Siletz Indian Reservation, and has passed the Senate.

Oregon Railway & Navigation.—The location is being made for an extension from Wallula Junction, Washington Territory, northeast to Riparia, near the Snake River.

Pemberton & Hightstown.—At a meeting of the stockholders in Camden, N. J., the action of the directors in cancelling the lease to the Pennsylvania, which was made in 1870, was approved. The Pennsylvania owns the rolling

stock now on the road. There is said to be no legal obstacle to the abandonment of the road, unless it is the uncanceled mortgage. A citizen's committee has asked the Pennsylvania to continue to operate the road from Pemberton to Cream Ridge, from which point it is 10 miles to Hightstown. This request will be considered.

Pennsylvania, Poughkeepsie & Boston.—Work was commenced on this road at Poughkeepsie, N. Y., last week. It is intended to form part of a through line between the coal fields of Pennsylvania and Springfield, Mass., by way of the Poughkeepsie Bridge, and the promise is held out that the road will be completed this year from a connection on the west with the New York, Lake Erie & Western near the New Jersey state line to the Hartford & Connecticut Western on the east.

Pensacola & Memphis—A preliminary survey has already been made of the road from Pensacola, Fla., northwest about 150 miles. A survey will soon be made southwest, starting from a point at or near Meridian, Miss. It will be an extension of the Warrior Coal Fields road, which is to extend from Meridian through the Warrior coal fields to Decatur, Ala. The contracts have not yet been let. Wyndham C. Jones, Conneaut, O., is secretary.

Puyallup Valley.—Chartered in Washington Territory by C. O. Bean, George W. McAllister, of Tacoma, and others, to construct a narrow-gauge road between Tacoma and Sumner, a distance of about 13 miles.

Roanoke & Southern.—The contract for constructing 14 miles of the road has been let to Breer & Feely and they have commenced work. John D. Spencer, Martinsville, Va., is President of the company.

St. Paul, Alexandria, Jennings, Lake Arthur & Gulf.—A preliminary survey has been made from Lake Arthur, Calcasieu County, La., through Jennings, to Alexandria, on the Texas Pacific, a distance of 91 miles. It is stated that the financial arrangements have been made, though it has not been decided when construction work will commence. E. R. Shankland, Jennings, La., is President.

Salt Lake & Fort Douglas.—The survey has been completed from Salt Lake City east to within a few miles of Fort Douglas, and it is thought that grading will commence soon after the survey has been finished.

San Diego & Elsinore.—It is expected that the grading between South Riverside and Elsinore will be completed in about two weeks, when the grading forces will be transferred to that part of the road between San Diego and Elsinore.

San Francisco, Clear Lake & Humboldt.—The preliminary surveys have been finished, and the contract to grade and equip the road has been let to the Clear Lake Improvement Co. It is to extend from Napa City, Napa County, Cal., to Clear Lake, a distance of 75 miles. The officers are given in another column.

San Francisco & Santa Cruz.—The survey has been commenced, starting from Colma, about eight miles south of San Francisco. F. T. Newberg is Chief Engineer.

Santa Ana, Fairview & Pacific.—The grading has been completed from Santa Ana, Cal., for about four miles, and from Fairview it has been completed for about two miles, leaving but two miles to complete the road between these points. It is the intention to extend it from Fairview to Newport harbor. E. L. Buck, Santa Ana, is President.

Seattle, Lake Shore & Eastern.—It is stated that Thomas Earle & Co., of Seattle, W. T., the contractors who are building the Seattle & West Coast road, which has recently passed into the control of this company, will soon put a large force of graders at work, and will push the road to completion as soon as possible. The engineers have found an easy grade for the second division, from Snohomish north to the Canadian border.

Southern Pacific.—A survey for an extension from Victoria to Beeville, Tex., will, it is said, soon be made.

South Pacific Coast.—It is stated that it has been decided to construct the gap of 130 miles, which will be necessary to complete the road.

Spokane & Montrose Motor.—Organized to construct a road from Spokane Falls, W. T., to Montrose Park, a suburban town.

Spokane & Palouse.—Tracklaying on this branch of the Northern Pacific has been completed to Genesee, Idaho, and surfacing will probably be commenced about July 1. The road passes through a fine wheat region.

Suwanee River.—It is thought that the entire line between Ellaville, Madison County, Fla., and Hudson-on-the-Suwanee, will be completed and in operation by May 1. A branch will be built this year to Luraville, Suwanee County. The main line will also be extended some 15 miles. The road is standard gauge and is being built and equipped by L. Bucki & Sons, of Ellaville, Fla. T. W. Koerner is Chief Engineer.

Tennessee & Coosa.—The road invites proposals until May 10 for the grading, masonry and bridges for the 76 miles from Gadsden through Guntersville to Huntsville, Ala. William H. Case, Gadsden, Ala., is Chief Engineer.

Tocoma, Ellensburgh & Conconully Railway & Navigation Co.—Incorporated in Washington Territory to operate a line of steamers on the Columbia River and to build a road from Ellensburgh, on the Northern Pacific. The capital stock is $1,500,000, and the general office is in Tacoma.

Troy & Tiptonville.—The location from Rives, Obion County, Tenn., west to the Mississippi River, a distance of 30 miles, has been completed and the contract for building and equipping the line has been let to W. Ferguson & Co., of Macon, Ga. It is proposed to extend the line to Fayetteville, Ark. The road is being built in the interest of the Newport News & Mississippi Valley road. John P. Inman, Troy, Tenn., is Chief Engineer.

Tucson, Globe & Northern.—The location has been completed from Tucson, Ariz., on the Southern Pacific, north to the Gila River, at a point about 25 miles south of Globe, and 30 miles of this has been graded. The 10 miles of the road at present in operation as narrow-gauge will be changed to standard, and extended by way of Globe to the eastern boundary of the territory, near the 35th parallel of latitude. The officers are given in another column.

Wabash Western.—Master E. T. Allen has filed a petition in the United States Circuit Court at St. Louis recommending an order that the Receivers assign and transfer to the Wabash Western Co., all the assets, accounts and pending suits remaining in their hands. The Receivers, Solon Humphreys and Thomas E. Tutt, have already been paid $70,000 each, but they asked for additional compensation. The master has been paid on account $36,500. He examined 19,771 claims, aggregating $815,801.

Wilmington & Sea Coast.—About two miles of track have been laid, and the work is progressing at the rate of about half a mile a day.

Wisconsin Central.—It has been decided to construct a branch of some 40 miles to Manitowoc, on Lake Michigan, this summer, with a view of putting on a line of steamers across the lake to Ludington or Grand Haven.

Wisconsin Midland.—It has been decided to construct the proposed branch from Fond du Lac, southwest through the counties of Fond du Lac, Dodge, Columbia and Dare, an estimated distance of 75 miles. D. C. Lamb, Fond du Lac, is Secretary.

TRAFFIC AND EARNINGS.

Railroad Earnings.

Earnings of railroad lines for various periods are reported as follows:

Month of March:

	1888.	1887.	Inc. or Dec.	P c.
Bur., C. R & Nor.	209,597	286,875	D. 77,278	27.3
Cal. South.....	147,157	143,452	I. 3,705	2.9
Cent. of Georgia.	356,922	316,483	I. 40,439	12.7
Central of Iowa..	124,407	133,345	D. 9,938	7.5
Ches., O. & S. W.	160,218	152,202	I. 8,016	5.3
Chic. & Ohio R...	3,601	6,890	D. 3,289	47.7
Chi.,St. P.& K.C.	172,424	112,347	I. 60,146	53.5
Chi. & W. M ...	111,028	127,979	D. 16,951	13.3
Cin., J. & Mack..	39,495	39,129	I. 366	0.9
Cin.,N. O. & T. P.	290,593	272,258	I. 18,335	6.6
Ala. Gt. South.	127,662	119,213	I. 8,449	6.7
N. Ori. & N. E.	74,898	53,845	I. 21,053	39 6
Vicks. & Mer..	40,411	42,313	D. 1,902	4.7
V., Shre. & P..	42,376	38,491	I. 3,885	10.1
Cin., R. & Ft. W.	36,832	37,116	D. 284	0.7
Cin. & Springf'd.	102,269	91,032	I. 11,237	12.3
Cin., W. & Balt..	167,870	183,905	D. 16,035	8.7
Cleve.,Ak. & Col.	51,310	49,584	I. 1,726	2.0
Cl., C., C. & I...	343,090	383,731	D. 40,641	10.4
Cleve. & Mar....	20 957	29 683	D. 8,726	27 5
Col. & Cin. Mid.	24,405	26,853	D. 2,448	7 6
Col., H. V. & T..	187,473	234,645	D. 47,172	20.0
Den. R. G. & W.	95,950	84,546	I. 11,404	13.0
Det., Lan. & No.	72,445	101,093	D. 28,648	27.7
Du., S. S. & At..	72,041	55,220	I. 16,821	29.0
E. Ten., Va. & G	437,322	414,382	I. 22,940	5.3
Ev. & Indianap.	18,210	21,422	D. 3,217	14.3
Ev. & Terre H...	69,243	72,250	D. 3 017	4.2
Flint & P. M..	207,558	236,973	D. 29,415	12.3
Fla. Ry. & N. Co.	92,770	90,692	I. 2,078	2.2
Georgia Pacific..	100,855	87,526	I. 13,329	15.0
Gr. Rapids & Ind.	195,573	206,139	D. 10,566	4.9
Grand Tr.of Can.	1,258,887	1,536,881	D. 277,994	14.8
Houston & T. C..	162,667	181,813	D. 19,146	10 5
Hum. & Shen....	10,300	10,674	D. 474	4.5
Ill.C..(I.& S.Div.)	877,660	956,897	D. 79,237	8.3
Cedar F. & Minn.	7,432	11,154	D. 3,722	33.4
Dub. & S. City....	80 205	72,714	I. 7,491	10.3
Iowa F. & S. City.	61,685	60,329	I. 1,356	1.7
Ind., Dec. & Spr..	25,424	38,665	D. 13,241	34.1
K. C., Ft. S. & G..	127,530	147,013	D. 19,483	12.3
K. C.,Sp. & Mem.	83,486	110,449	D. 26,953	23.7
K. C.,Cl. & Spr...	12,732	14,076	D. 1,344	7.2
Kentucky Cent...	76,184	77,227	D. 1,043	1.3
Keok. & West....	24,092	28,503	D. 4,411	14.3
L. Rk. & M	61,573	66,397	D. 4,824	6.1
Long Island.....	168,917	196,902	D. 27,985	14 3
Lou., Ev. & St. L.	72,221	92,343	D. 20,122	21.8
L., N. A. & Chi..	153,064	191,301	D. 38,237	15 0
L., N. O. & Tex..	174,188	152,879	I. 21,309	14.0
Mar., Col. & Nor.	6 656	4,267	I. 2,389	49 0
Memphis & Chas	123,977	127,816	D. 3,839	3.1
Mexican Central.	550,500	399 974	I. 150,526	37.7
Mex. National....	167,747	159,600	I. 8,147	5.1
Mexican Railway.	328,968	276,310	I. 52 658	18.8
Minn. & St. L...	105,000	162,071	D. 57,071	42.9
Nash., C. & St. L.	257,132	245,733	I. 11,399	44.9
Nat.,Jack. & Col.	12,177	12,998	D. 821	6.3
N. Y., Ont. & W.	108,404	114,863	I. 3,541	2 6
Ohio & Miss.....	294,216	390,697	D. 96 481	24.6
Oregon R & N.Co.	557,400	457,103	I. 100,297	22.0
Pitts. & West ...	120,006	168,795	D. 48 789	29.1
Rich. & Danv....	389,150	364,378	I. 24,772	6.8
Va. Mid. Div...	136,525	127,300	I. 9,225	7.1
Char., C. & A.	80,700	76,365	I. 4,335	5.2
Col. & Gr. Div.	53,100	50,148	I. 2,952	6.0
West. N. C.Div.	56,400	55,483	I. 917	1.7
W. D.& W. Div.	8,125	7,400	I. 725	9.8
Ashev. & Spa...	7,700	4,083	I. 3,617	75.0
St.L.A.&T.H.M.I.	177 904	193,732	D. 15,828	8.2
St. L. Branches..	74,360	76,562	D. 2,202	2.6
San.A. & Aran. P.	67,564	26,087	I. 41,477	157.7
Shenandoah Val.	71,000	70,793	I. 207	0.2
Staten Is. R. T...	42,643	45,336	D. 2,693	6 6
Tol., P. & West...	69,427	87,690	D. 18,263	20.1
Wisconsin Cent..	291,493	342,790	D. 51,297	14.5
Total	11,792,447	12,247,215	D. 454,768	3.7

Early reports of monthly earnings are usually estimated in part, and are subject to correction by later statements.

Anthracite Coal Tonnage.

The anthracite coal tonnage for the month of March and the three months of this year is reported by John H. Jones Chief of Bureau, as follows:

	March. 1888.	March. 1887.	Inc. or Dec.
Phila. & Reading	550,950	603,869	D. 52,919
Central of N J.....	361,055	453,722	D. 92,667
Lehigh Valley..... ..	448,507	618,767	D. 170,259
Del., Lack. & West....	498,651	452,181	I. 46,471
Del. & Hud. Canal Co...	371,190	291,908	I. 79 381
Pennsylvania	303,933	284,632	I. 19,300
Pennsylvania Coal Co....	80,423	138,192	D. 57,769
N. Y., L. E. & W.. ...	70,919	68,000	I. 2.919
Total....	2,685,728	2,911,271	D. 225 543
From Wyoming Region..	1,661,833	1,481,243	I. 180,589
" Lehigh " ..	216,326	549,283	D. 332,957
" Schuylkill " .	807,569	880,744	D. 73,175

	Three months. 1888.	Three months. 1887.	Inc. or Dec.
Phila. & Reading	859,735	1,666,302	D. 746 566
Central of N. J....	1,051,982	1,043,940	I. 8,001
Lehigh Valley	1,080,858	1,509,015	D. 428,156
Del., Lack & West.....	1,756 837	1,284,900	I. 471,937
Del. & Hud. Canal Co...	1,182,277	991,910	I. 190,367
Pennsylvania.....	969,229	763,243	I. 205,985
Pennsylvania Coal Co ...	361,329	315,029	I. 46,299
N. Y., L. E. & W..... ...	207,492	191,206	I. 16,286
Total...	7,469,743	7,705,587	D. 235,844
From Wyoming Region..	5,592,103	4,116,212	I. 1,475,890
" Lehigh " ..	316.598	1,305,656	D. 989,057
" Schuylkill " ..	1,561,040	2,283,719	D. 722,678

The stock of coal on hand at tide-water shipping points March 31, 1888, was 465,709 tons; on Feb. 29, 1888, 232,501 tons; increase, 233,208 tons.

This statement includes the entire production of anthracite coal, excepting that consumed by employés, and for steam and heating purposes about the mines, but does not represent the entire anthracite coal tonnage actually transported by the respective coal companies, adjustment being necessary in the compilation to avoid duplications, etc.

Traffic Notes.

Chicago dispatches of April 14 stated that the Chicago & Atlantic was selling first-class tickets to Boston at $2 less than regular rates. The reason given is the practice of the Lake Shore in carrying passengers on its fast limited train without additional charge.

Vice-Chairman Daniels has decided the dispute between the Chicago-Detroit roads concerning passenger rates by fixing the rate for the Michigan Central at $8 first and $6 second class, the Chicago & Grand Trunk $7.75 and $5.50, and the Niagara Falls Short Line (Wabash) $7.25 and $5.25.

The Chicago & Alton, which has close traffic agreements with the Atchison, Topeka & Santa Fe, is said to be preparing to make such an agreement with the Missouri Pacific. the Atchison's new line to Chicago destroying the value of the other. The Missouri Pacific system now reaches Pueblo Col.

The opening of the new competing route to Mexico, via Eagle Pass, has had the effect of making important reductions in rates to points this side of the line. El Paso now gets some freight from the north at 50 per cent. less than former rates.

ANNUAL REPORTS.

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Chicago, Burlington & Quincy.

An abstract of the preliminary report of the Chicago, Burlington & Quincy was given in our issue of March 2, p. 142. We note the following additional facts:

The actual length of road in operation Dec. 31, 1887, was 4,693 miles, against 4,036 miles Dec. 31, 1886—an increase of 657 miles.

The average number of miles operated in 1887 was 4,239, against 3,743 the year before. The gross earnings per mile of road operated were $6,505.33 in 1887, against $7,140.90 in 1886. The net earnings per mile in 1887 were $2,707.75, against $3,269.23 in 1886. The percentage of operating expenses, including taxes, to gross earnings in 1887 was 58.38 against 54.22 per cent. in 1886.

The properties controlled by this company, whose operations are not embraced in this report, show an increase in net surplus for the year of about $830,000, the surplus being about $1,620,000 in 1887, as against about $790,000 in 1886.

The amount charged to new construction during the year was $13,756,748; to equipment, $1,374,795. The latter amount was very much larger than during the previous year, but the amount of new equipment was also decidedly greater, including more than 2600 cars of every description.

"The general condition of the road and equipment has been maintained during the year, with the exception of the locomotives west of the Missouri River, where, owing to the rapid increase in mileage without a corresponding increase in engines, those in use have been overworked, and it has not been possible to keep them as fully in repair as usual."

The total number of passengers carried in 1887, exclusive of those carried on mileage and season tickets, was.....	5,750,348
In 1886.....	5,213.595
Increase in 1887.....	536.753
Total number of tons of freight carried in 1887 (including the Illinois Central in its own cars, 338,356 tons) was	9,752,325
In 1886 (including the Illinois Central, 406,595 tons) was.....	8,534,708
Increase in 1887.....	1,217,617

With an increased freight traffic in 1887, as compared with 1886, of over 1,200,000 tons, or more than one hundred thousand car-loads, the gross freight earnings show a falling off of $692,280.44. The explanation is that, while there has been a large *decrease* in the long-haul east-bound corn traffic from Iowa, Nebraska and Kansas, there has been a still greater *increase* in the movement of coal and other low-rate freight west bound.

"Operating expenses show an increase in 1887 over 1886 of $1,606,229.89, due chiefly to unusually heavy expenditures for steel rails and ballast, to the increase in mileage, and to the larger volume of tonnage referred to above. The cost of operating per mile of road in 1887 was $3,797.57, against $3,871.67 in 1886, a decrease of $74.10 per mile.

"Late in the year there was a general decline in freight rates, which has become more marked since the year closed, and will be seriously felt in our earnings in 1888. This is due largely to the absence of any means of self-regulation among the railroads because of the prohibition of pooling by the Inter-state Commerce law. Those who remember how difficult it was to maintain steadiness in rates among a comparatively small number of railroads fifteen or twenty years ago, before the pooling system was much in use, can easily understand the difficulty of doing so at the present time, with the greater number of competitors in the field. The law attempts to check the effect of prohibiting pools by the long and short haul provision; but unfortunately the check amounts to but little, because there is almost always some one competitor with little local business to be affected, which has the power to fix through rates for all, and hence to force those lines which have built up a valuable local traffic either to go out of the through traffic or reduce local rates to the level of the through rates. But in such cases there is really no choice, for the reason that the so-called local business is in fact carried on in competition with similar business at the strictly competing points, of which there are now a great many; and to attempt to maintain rates upon it by refusing to meet the rates made at neighboring places where two or more roads intersect is simply to drive all such business away from the so-called local stations.

"Another effect of the Inter-state Commerce law, as interpreted, is its tendency to drive the wholesale or jobbing trade to cities which enjoy water competition, and to reduce the amount of such business at interior cities wholly dependent on railroads, where heretofore a large aggregate traffic may have made it an object to fix lower rates, even if the length of haul were greater, than the roads can afford to accept on the retail trade of smaller towns in the neighborhood. Whether this is, on the whole, beneficial or not, remains to be seen.

"Local trade centres tend to economy in the transaction of the business of the community, and thus, probably, to an increase in the aggregate amount of business transacted. To take away from such centres, by statute, the natural advantages of the concentration of capital and trade, so far as railroad transportation is concerned, is, to say the least, an experiment. That it is regarded as a more or less dangerous one is evident from the efforts which are being made in some of the states to fix state rates by law in the hope of offsetting the apparent consequences of national legislation."